10 MARCH 1955 ELECTRICAL ENGINEERS EXHIBITION ONE SHILLING

# ELECTRICAL TIMES

Here is the motor starter for today, tomorrow and years ahead—a design that is new in every detail, from the leading motor control gear specialists in Britain. Built for heavy duty and for vital machine tool applications, it will last as long as the equipment it protects.

OUTSTANDING FEATURES INCLUDE

- Unit construction to meet a wide variety of purposes from one set of standard units.
- Precision overload relays with heaters designed specifically for individual motor ratings.
- One starter for both auto and manual operating.
- Easiest of all starters to install and maintain.

Ratings 1½—15 H.P.

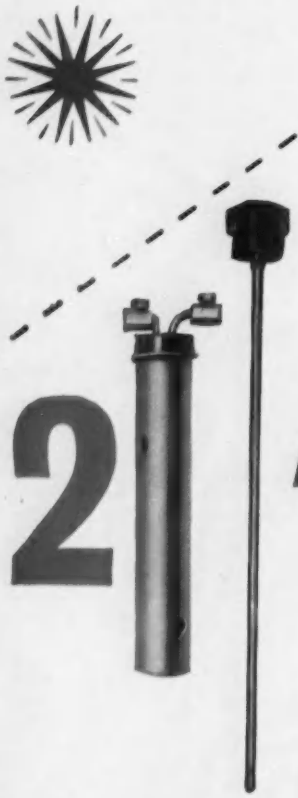
Send for 'Autoline' Brochure (Pub. No. 867)

THE FINEST
PROTECTION A MOTOR CAN HAVE
THE NEW MEM
*Autoline*

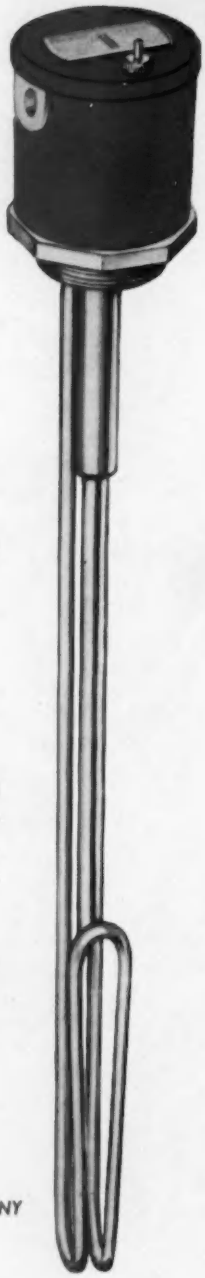
Visit M.E.M. at STAND No. 125 at the Electrical Engineers Exhibition.

MEM

MIDLAND ELECTRIC MANUFACTURING CO., LTD.,
TYSELEY, BIRMINGHAM, 11. *Branches at London and Manchester*



# 2 into one will go!



## now the Creda 'Redhead' is even further ahead!

***it scored***

on lowest price, highest quality (complies with B.S. 1556)

***it scores***

again with the 'Double-D'—a new version of the Redhead, with a thermostat pocket made double diameter width to accommodate either conventional rod type thermostats . . . or the new, large-diameter, short-stemmed types! Write to us for lists—WH2050/WH2052.

**stock this EVEN BETTER**

## *Double "D" Redhead*

A **Creda** PRODUCT

MADE BY THE HOUSE OF **Simplex** A COMPANY

Simplex Electric Co. Ltd. Creda Works Blythe Bridge Staffs

*There can be only <u>one</u> winner in any field . . .*

and Benjamin are the leaders when it comes to tungsten and fluorescent lighting for industry. A special feature of our world-famous fittings is their 'Crysteel' vitreous enamel finish. Withstanding the most arduous factory conditions, it retains its snow-white surface and a high light output, year after year. The efficiency and sturdiness of 'Crysteel' is just <u>one</u> reason why you can rely on . . .

*Better lighting by*

EARLS COURT ELECTRICAL ENGINEERS EXHIBITION LIMITED A.S.E.E. MARCH 15th TO 19th 1955

# BENJAMIN REGD.

**THE BENJAMIN ELECTRIC LTD · TOTTENHAM · LONDON N.17**
*Telephone: TOTtenham 5252 (5 lines) Telegrams: "Benjalect, Southtot, London"*
**BIRMINGHAM:** 5, Corporation Street, Birmingham 2. Tel. MIDLAND 5197
**LEEDS:** 49, Basinghall Street, Leeds 1. Tel. LEEDS 25579

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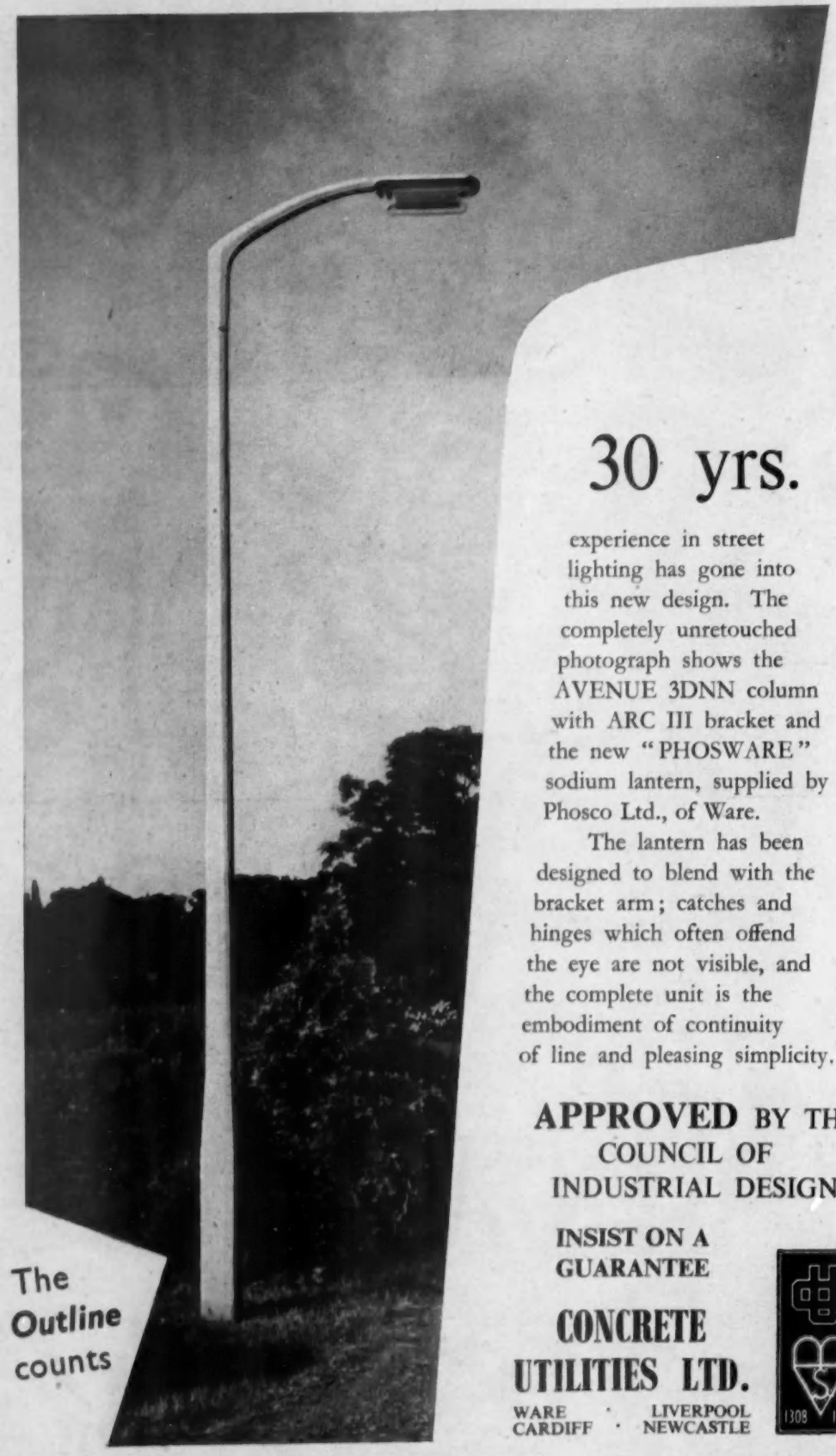



# 30 yrs.

experience in street lighting has gone into this new design. The completely unretouched photograph shows the AVENUE 3DNN column with ARC III bracket and the new "PHOSWARE" sodium lantern, supplied by Phosco Ltd., of Ware.

The lantern has been designed to blend with the bracket arm; catches and hinges which often offend the eye are not visible, and the complete unit is the embodiment of continuity of line and pleasing simplicity.

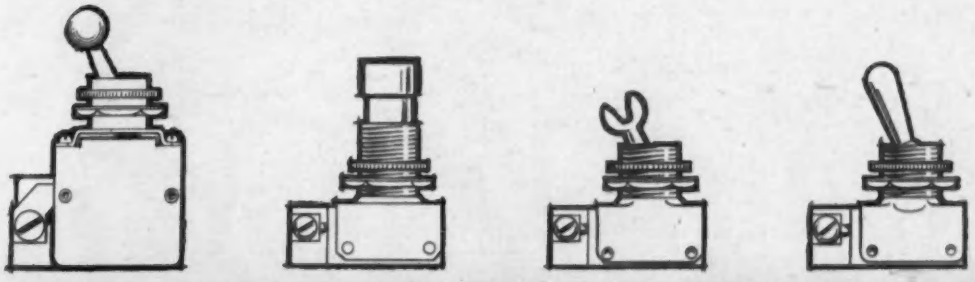
**APPROVED** BY THE COUNCIL OF INDUSTRIAL DESIGN

**INSIST ON A GUARANTEE**

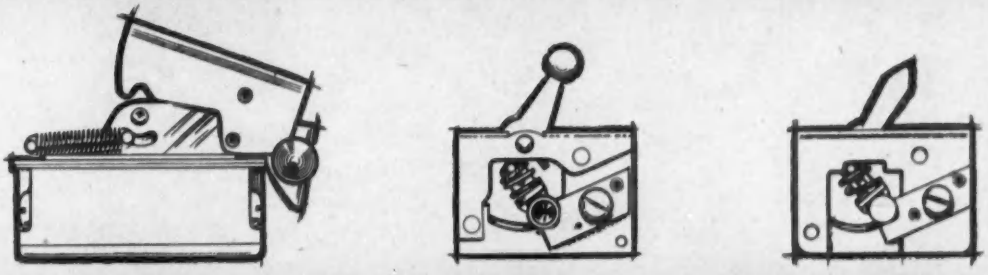
**CONCRETE UTILITIES LTD.**

WARE · LIVERPOOL
CARDIFF · NEWCASTLE

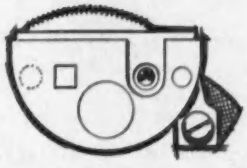
1308 1946

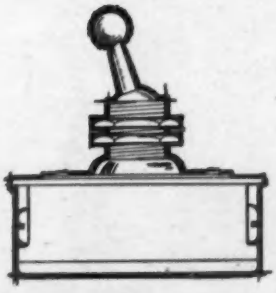


# APPLIANCE



# SWITCHES by





# ARROW

The Arrow range of appliance switches is the largest and most complete offered by any British manufacturer. All are of original design, many of them unique, and they are readily acceptable in overseas markets.

To deal with a manufacturer who for over 60 years has made switches — and nothing but switches — offers advantages extending far beyond these important considerations. Quantity production ensures continuity of supply; quality of craftsmanship is backed by quality of materials; the maintenance of stringent standards is ensured by the most modern inspection methods. A realistic manufacturing policy in a highly competitive field, rivalled only by the essentially realistic nature of our prices . . .

**SEND US YOUR SPECIFICATIONS**

ARROW ELECTRIC SWITCHES LTD · HANGER LANE · LONDON · W.3

**We are exhibiting at the A.S.E.E. Exhibition Earls Court March 15—19 Stand 117**

# INSULATION at -50°C to +250°C

*New Insulation Tapes with exceptional advantages.*

Dunlop is now able to offer a new and large range of insulation tapes which possess many advantages for applications in the electrical industry. The tapes are semi-vulcanised and consist of a glass fabric coated with silicone rubber and provide an excellent insulation material over the very wide temperature range of —50°C. to +250°C. It is because of this, in addition to the fact that they have high thermal conductivity, thermal stability, resistance to oxidation, to corona attack and electrical fatigue that they have created a new standard for dielectric material.

Dunlop silicone insulation tapes have a high tensile strength and are supplied in a semi-cured state so that after wrapping they can be vulcanised into a homogeneous, moisture-proof and oil resistant jacket for field coils and solenoids etc. Unlike most resinous coatings and insulations Dunlop silicone tape does not become progressively more brittle when exposed to high temperatures but retains its rubber-like characteristics and in applications where vibration is a problem it will solve many insulation difficulties.

The complete range of sizes is available with coatings on one or both sides—the thickness of the coatings can be varied to suit individual requirements. Please write to the address below for any further information of the product which will help you in your own electrical insulation problems.

## SILICONE RUBBER GLASS CLOTH INSULATION TAPES BY

# DUNLOP

DUNLOP RUBBER CO. LTD. (GENERAL RUBBER GOODS DIVISION), CAMBRIDGE STREET, MANCHESTER 1

60/67

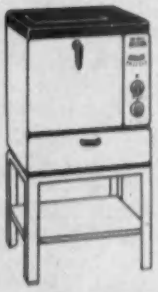
Life is smooth and life is even—but monotonous? Never! Not with responsibilities like mine. I happen to be the power behind an important production process. No, I'm not bored; that sound you hear is the hum of quiet contentment . . . a murmur of satisfaction at a job well done.

*I'm a Busy Little Bee from G.E.C.*

# G.E.C. Fractionals

THE GENERAL ELECTRIC COMPANY LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

# for small family cooking



You can't beat a Belling 45A! There are three main reasons why the Baby Belling is a best seller:-

1 ***PERFORMANCE:*** although it is known technically as a 'small cooker', it has a very large oven, a large hotcupboard and 10″ × 8″ grill-boiler; it does every cooking job to perfection–and with great economy–for one, two or three people, and more if need be.

2 ***PRICE:*** it costs only **£13 15 0** (Stand 44/- extra).

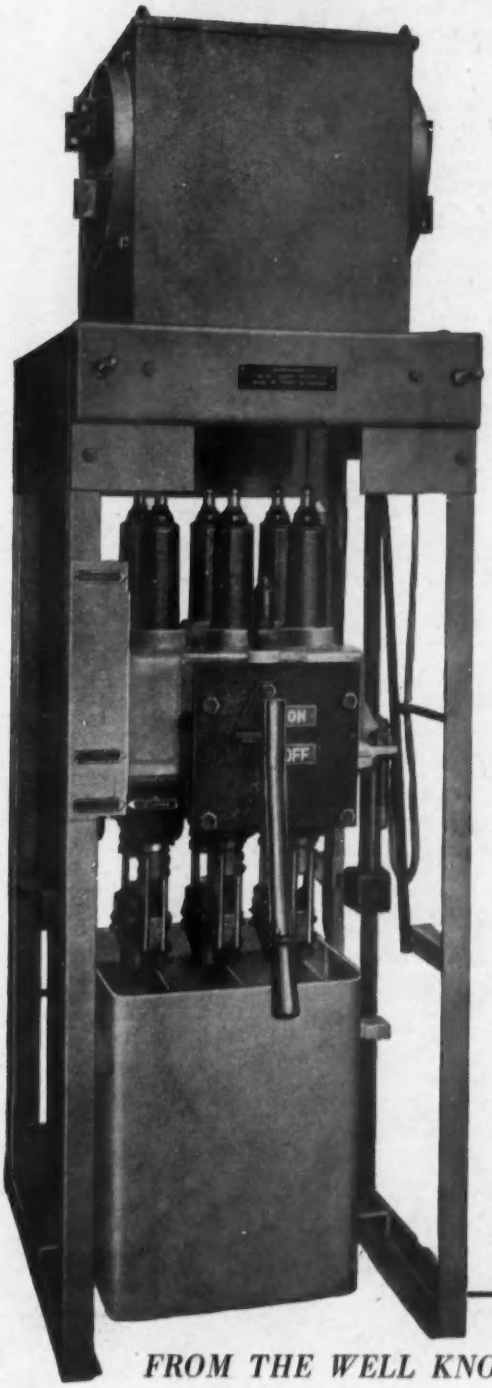
3 ***ADVERTISING:*** the Baby Belling is being advertised on a massive scale. There are frequent spaces in nearly 200 national daily, provincial evening and local weekly newspapers. If your stocks are getting low, please get in touch with us right away.

# you can't beat a "Belling"

BELLING & CO. LTD • BRIDGE WORKS • ENFIELD • MIDDX • HOWARD 1212

CBC 427

# AN OIL-SWITCH YOU CAN




# ISOLATE

***without interrupting supply in ring main units***

## DESIGNED...

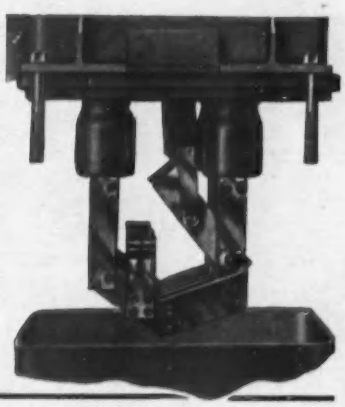
. . . to enable complete isolation of the switch for ease of inspection and maintenance (with no interruption of supply in ring main units)

. . . to make and carry fault currents up to 250 MVA at 6.6 kV (also tested to B.S. 116/1937)

. . . so that electro-magnetic forces assist the closure of the switch under through-fault or short-circuit conditions (it cannot possibly be forced open)

. . . for mounting on a simple framework (yet having a full complement of interlocks)

. . . for maximum voltage of 11 kV and maximum current rating of 600 amperes (it has liberal clearances yet small dimensions)



★ Internal view of a unit showing contact arrangement

*FROM THE WELL KNOWN* TRINAL RANGE
*OF INTERCHANGEABLE SWITCHGEAR*

**JOHNSON & PHILLIPS LTD.**
**CHARLTON · LONDON · S.E.7**

**ELECTRICAL ENGINEERS' A.S.E.E. EXHIBITION**

**MARCH 15th—19th, 1955 STAND NO. 134**

SWAN BRAND

**IMMERSION HEATING ELEMENTS**

To special designs for Domestic and Industrial Applications.

**DOMESTIC ELECTRICAL APPLIANCES** including Electric Kettles, Percolators, Fires, Blankets and Ground Base Aluminium Holloware.

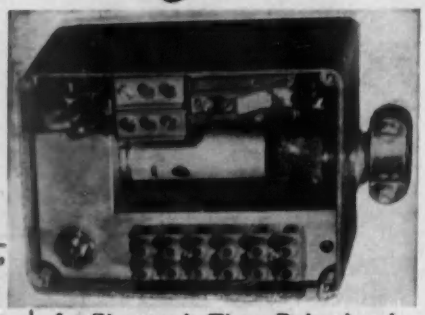
BKB

**ELECTRIC MOTORS**

Electric Motors from the smallest fractional sizes up to 7½ h.p. for both A.C. and D.C. supplies. A.C. and D.C. Generators up to 20 kw. Special sizes built to individual requirements.

*Bulpitt & Sons Ltd., Birmingham 18* M-W.372

**TIME DELAY** *Unit*



THE 'GATLEY' ELECTRONIC TIMER

**An Electronic Time Delay invaluable in many fields of Electronics and electrical engineering, e.g. process control, photographic exposure timing, etc. Time intervals range from 1/5th sec. to 1 min. In die-cast case suitable for wall mounting.**

*Write for leaflet*

**F.C.ROBINSON**

& PARTNERS LIMITED.

COUNCILLOR LANE · CHEADLE · CHESHIRE

*MAKERS OF FINE INSTRUMENTS*

**ALWAYS SPECIFY**

**STURDY TRANSFORMERS**

*and be certain of*

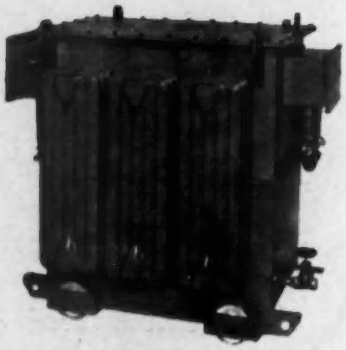
**SATISFACTION**

**Sturdy Transformers are manufactured for all Industrial applications from 1 kVA to 100 kVA.**

**They are being supplied regularly to Government Departments — N.C.B. B.E.A. and many large industrial users.**

**OUR MANY CUSTOMERS ARE OUR RECOMMENDATION**

***Our technical service is at your disposal.***



*Write for our illustrated brochure*

**STURDY ELECTRIC COMPANY LIMITED**

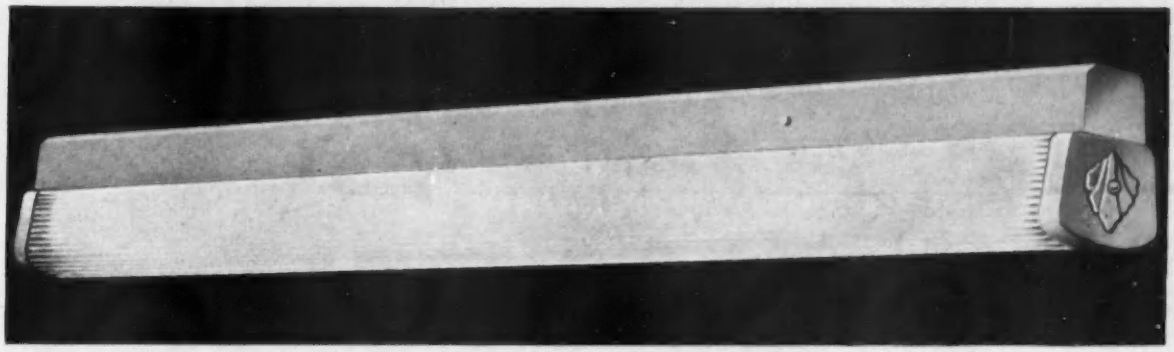
**BURNOPFIELD NEWCASTLE UPON TYNE**

*Telephone: Burnopfield 237*

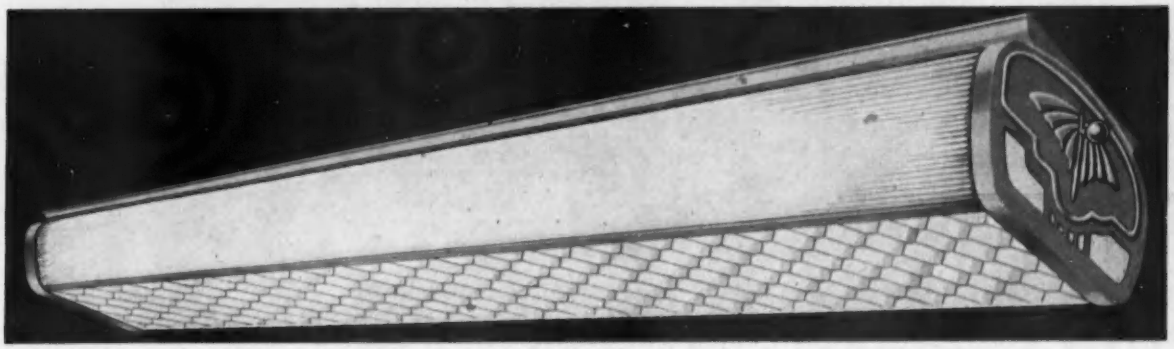
# *Decorative Lighting*

**with**

## TECHNICAL EFFICIENCY *in 5′, 4′ or 2′ Fluorescent Fittings!*



**F51231**—*Reeded perspex diffuser fitting with decorative metal ends, totally enclosed, with control gear incorporated. Available in 5ft., 4ft. and 2ft. single or twin lamp.*



**F52222**—*Reeded perspex diffuser fitting with decorative metal ends. Either complete or open diffuser or with honeycomb metal louvre. Available in 5ft., 4ft. and 2ft. twin or triple lamp.*

# EKCO

## DECORATIVE FLUORESCENT FITTINGS

STAND No.
**60**
A. S. E. E.
EXHIBITION
EARLS COURT

**EKCO-ENSIGN ELECTRIC LTD., 45 Essex Street, Strand, London, W.C.2. TEL: CITY 8951**

Sales Offices, Illuminating Engineering Depts., Showrooms and Depots:

**Southern:** 45 Essex Street, London, W.C.2. Tel: City 8951
**Northern:** Blackett St., Manchester, 12. Tel: Ardwick 4661
**Midlands:** 68 Caroline St., Birmingham 3. Tel: Central 2997
**E. Midlands:** 57 Hounds Gate, Nottingham. Tel: Notts 45862
**Scottish:** 26 India Street, Glasgow, C.2. Tel: Central 2012
**South Wales:** 50 Bridge Street, Cardiff. Tel: Cardiff 33803

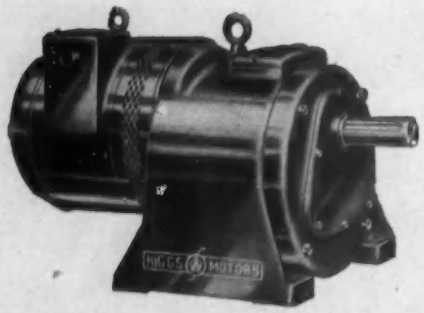
ELS

TRADE MARK

# HIGGS MOTORS LTD.

CHAIRMAN WALTER F. HIGGS M.I.E.E.

BIRMINGHAM 6 ENGLAND



**HIGGS GEARED MOTOR UNIT**
for
Reduced Speed at Competitive Prices

**GUARANTEED FOR EVER**

Belfast · Bristol · Cardiff · Dundee · Glasgow · Hull · Leeds · Liverpool
London · Manchester · Newcastle · Peterborough · Sheffield · Wolverhampton

# "I told him straight! . . ."

*said the Factory Manager*

"*I told the Guv'nor straight*," he said, "*— if you want this lot out on time, I want more up-to-date handling equipment!*"

We murmured admiration for his fearlessness . . . then we told him we were from Yale & Towne; we'd been called in by "the Guv'nor" to see how we could help.

"*Well, you can see for yourself the trouble*," he said, with a sweep of his hand. "*Hold-ups here — hold-ups there. We just can't keep the stuff moving.*"

We checked everything that was moved in, around and out of the factory. Our recommendations went to the Board.

A couple of months later we were back at the factory watching the early runs with the new equipment. Everyone was enthusiastic about the way things were going. They had every reason to be: production hold-ups had become a thing of the past.

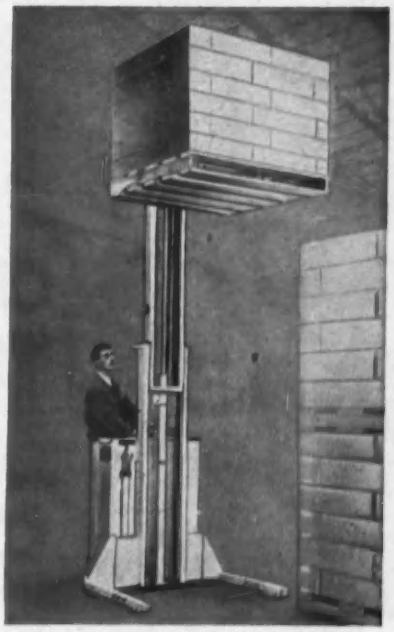
"*The way the Guv'nor's beaming, you'd think it was all his idea*," said the Factory Manager.

Why not pass your handling problems to us? Our Technical Representatives will call and advise you how Yale can solve your materials handling problems and help reduce production costs.

**Here's a *new* answer to your "no-space" problem!**

The new "Warehouser" range is the latest and most advanced driver-operated series of trucks now available . . . compact, more manœuvrable, fast and safe! The "Warehousers" give you all these outstanding advantages:—

- ★ Rounded rear end for right angle stacking in 5 and 6 foot aisles.
- ★ Lightweight for low floor loadings.
- ★ One hand operation for hoist, lower and drive.
- ★ "Dead man" control — applies brakes, cuts power.
- ★ Safe and easy driving position.
- ★ Fast handling speeds.
- ★ Straddle fork lift models available in 2,000 and 3,000 lbs. capacities, with standard lifts to 147". Pallet and low lift platform models up to 2 tons capacity.
- ★ Available with either lead-acid or nickel-alkaline batteries.
- ★ Low initial cost, low running cost, economical up-keep, long life.



*The "Warehouser" Fork-Lift Straddle Truck.*

**MATERIALS HANDLING EQUIPMENT**

MADE IN ENGLAND BY

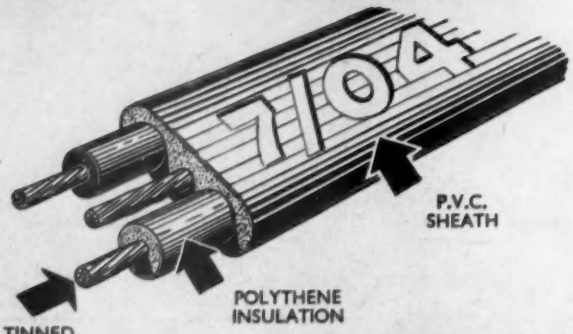
**YALE**

REGISTERED TRADE MARK

**THE YALE & TOWNE MANUFACTURING COMPANY**

MATERIALS HANDLING DIVISION (DEPT. N3) · WEDNESFIELD · STAFFS · PHONE WILLENHALL 630

# ASHATHENE CUTS COSTS!




## SAVE ON MATERIAL

ASHATHENE is a tough yet flexible cable with tinned copper conductors insulated with polythene. The cores are colour coded in accordance with B.S.S. and I.E.E. requirements to provide ready identification. Thanks to the p.v.c. sheathing, the cable may be embedded in plaster or cement without any deterioration occurring.
Armoured ASHATHENE cables are also available for power wiring and provide that extra mechanical protection usually required in factory installations.

See us at the ELECTRICAL ENGINEERS EXHIBITION at Earls Court
MARCH 15—19 **STAND 147**

## SAVE ON LABOUR

ASHATHENE is already established as cable which enables a safe and permanent electrical installation to be made in less time and at lower expenditure.
Time spent on conduit bending and screwing may be eliminated since ASHATHENE readily cleats into position along girders, walls, etc. ASHATHENE is easily manipulated and strips cleanly and quickly. You are invited to send for leaflets and technical data which deal with electrical and mechanical characteristics and notes on wiring methods. ASHATHENE is manufactured to B.S.S. 1557 in the types where this specification is applicable.

**ASHATHENE IS COMPETITIVELY PRICED THROUGHOUT THE WIDE RANGE OF ARMOURED AND NON-ARMOURED TYPES.**

# AERIALITE LIMITED

**CASTLE WORKS, STALYBRIDGE, CHESHIRE.** Depots at: London, Bristol, Birmingham, Manchester, Newcastle, Glasgow.
*This is an advertisement of the Aerialite Ltd. group of companies.* C.106 J.Y.

# PHOSPHOR BRONZE

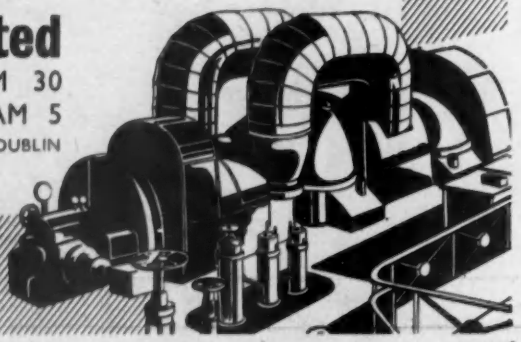
**FOR THE ELECTRICAL INDUSTRY**

*** SHEET, STRIP, ROD, WIRE, TUBE, CHILL CAST BARS**

*In a range of alloys containing 5%—12% Tin for specific purposes, to private specifications and to British Standard Specifications.*

## Charles Clifford Limited

DOG POOL MILLS, BIRMINGHAM 30
and FAZELEY ST. MILLS, BIRMINGHAM 5
OFFICES: LONDON, GLASGOW, MANCHESTER AND DUBLIN



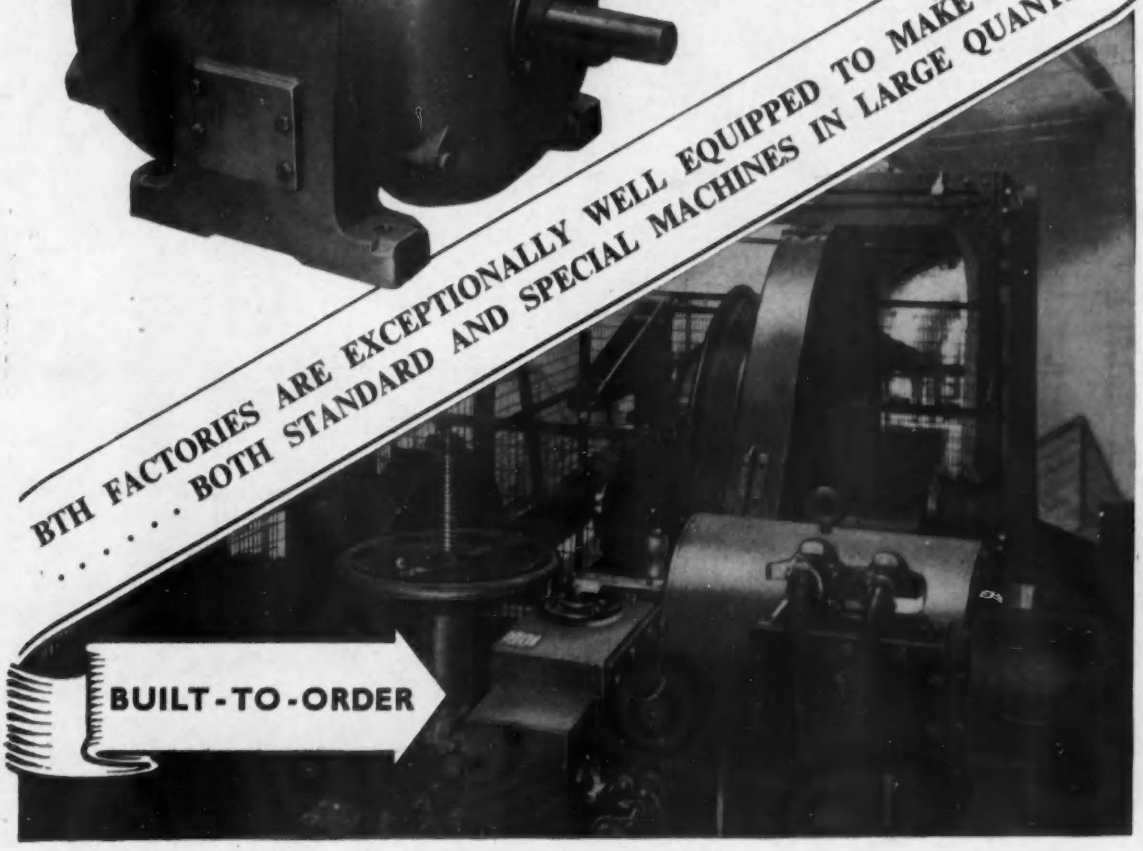
M-W.106

# *Wheels of industry the world over are turned*

## by B T-H ELECTRIC MOTORS

STANDARD STOCK

BTH FACTORIES ARE EXCEPTIONALLY WELL EQUIPPED TO MAKE . . . . . BOTH STANDARD AND SPECIAL MACHINES IN LARGE QUANTITIES



BUILT-TO-ORDER

AC or DC

No manufacturer can offer a wider choice of electric power unit than BTH whose Trade Mark is accepted by manufacturers and users as a symbol of advanced design and proved performance, with years of trouble-free service. Remember! A *BTH* power-engineer has no incentive to recommend anything but the correct motor for the job—be it 'standard' or specially built to your requirements.

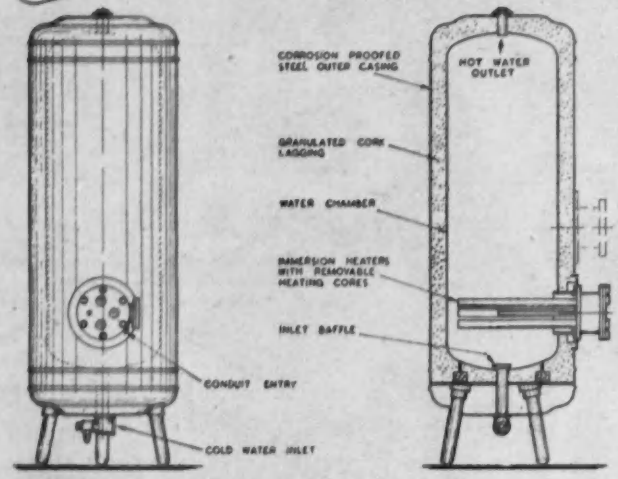
THE **BRITISH THOMSON-HOUSTON** CO., LTD., RUGBY · ENGLAND

*Member of the AEI group of companies* A4281

ELECTRICAL ENGINEERS EXHIBITION. Visit our **Stand No. 71**

# Heatrae FLAME-PROOF FLP EQUIPMENT

## CERTIFIED FOR GASES GROUPS II & III




### WATER HEATERS

THE ILLUSTRATION OPPOSITE SHOWS A TYPICAL EXAMPLE OF A HEATRAE ELECTRIC WATER HEATER MODELS ARE AVAILABLE FOR MOST APPLICATIONS AND INCLUDE:- WALL OR FLOOR MOUNTING; ROUND OR RECTANGULAR; PRESSURE, NON-PRESSURE OR CISTERN TYPES, CAPACITIES 3 TO 100 GALLONS
FOR FURTHER DETAILS SEE SECTIONS AS UNDER –

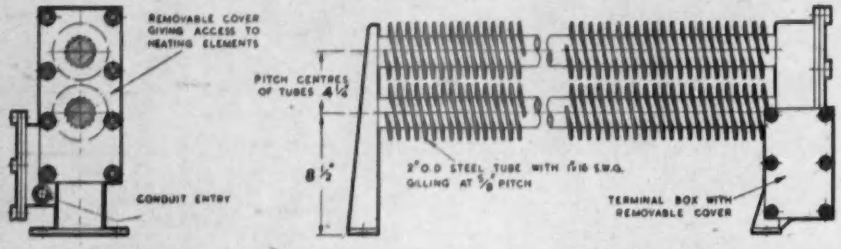
| | MTG. | TYPE | SHAPE | CAP.(GALLS) | SECTION |
|---|---|---|---|---|---|
| CISTERN TYPE | WALL | F.B. | RECTANGULAR | 5 - 30 | F 11 |
| | FLOOR | R.B.F. | ROUND | 20 - 100 | F 12 |
| | WALL | R.B. | ROUND | 12 - 33 | F 13 |
| PRESSURE TYPE | FLOOR | R.T.F | ROUND | 30 - 100 | F 14 |
| | WALL | R.T | ROUND | 5 - 33 | F 15 |
| NON PRESSURE TYPE | WALL | R.T.A. | ROUND | 5 - 33 | F 16 |
| | WALL | D.O.T | 'D' SHAPED | 3 | F 17 |

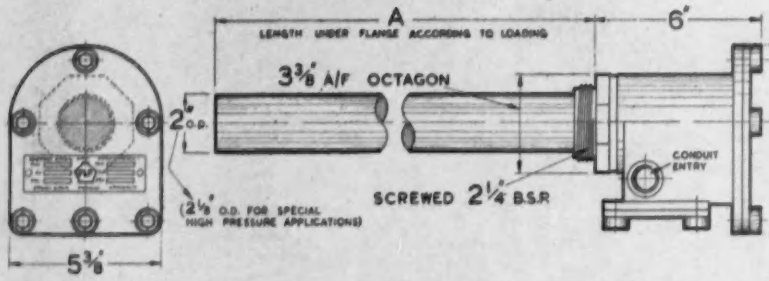
PLEASE GIVE FULL DETAILS OF REQUIREMENTS, WE WILL SEND APPROPRIATE DRAWING WITH QUOTATION

### GILLED TUBE AIR HEATERS

WELDED STEEL CONSTRUCTION, IN STANDARD RANGES OF ONE TO FIVE TIERS. EACH RANGE 2'-6", 3'-6" OR 4'-6" LONG. ELECTRICAL LOADINGS 500 TO 5000 WATTS.
WALL OR FLOOR MOUNTING DETAILS GIVEN ON SECTION F9.

ALSO PLAIN TUBE HEATERS IN RANGES ONE TO FIVE TIERS AND LENGTH UP TO 8 FEET. DETAILS GIVEN ON SECTION F10.


REMOVABLE COVER GIVING ACCESS TO HEATING ELEMENTS
CONDUIT ENTRY
PITCH CENTRES OF TUBES 4½"
8½"
2" O.D. STEEL TUBE WITH 7/16 S.W.G. GILLING AT ⅝" PITCH
TERMINAL BOX WITH REMOVABLE COVER




### IMMERSION HEATERS

ILLUSTRATION SHOWS A TYPICAL REMOVABLE CORE IMMERSION HEATER

HEATRAE FLAMEPROOF IMMERSION HEATERS ARE MADE IN A WIDE RANGE FOR VARIOUS HEATING DUTIES, THE ELECTRICAL LOADING BEING RELATED TO THE LIQUID TO BE HEATED.

REMOVABLE CORE PORCELAIN FORMED IMMERSION HEATERS — SECTION F1.F3.F4.F7

BLADE TYPE MICA FORMED IMMERSION HEATERS — SECTION F2.F5

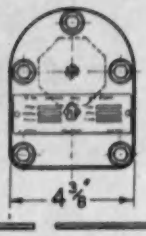
EMBEDDED ROD TYPE IMMERSION HEATERS — SECTION F6.F19

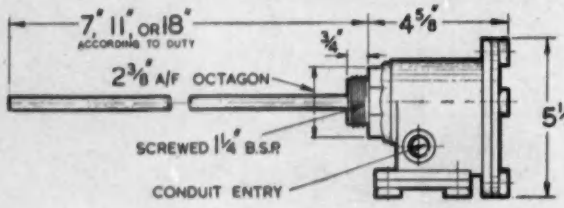
CERTAIN TYPES OF THESE HEATERS ARE FITTED WITH INTEGRAL THERMOSTAT.

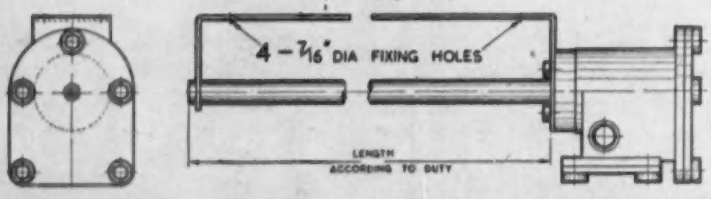
### THERMOSTATS – FOR LIQUIDS

SUITABLE FOR USE IN CONJUNCTION WITH ONE OR MORE OF THE ABOVE IMMERSION HEATERS NOT FITTED WITH AN INTEGRAL THERMOSTAT.

REFER TO SECTION F 2 FOR FURTHER DETAILS.



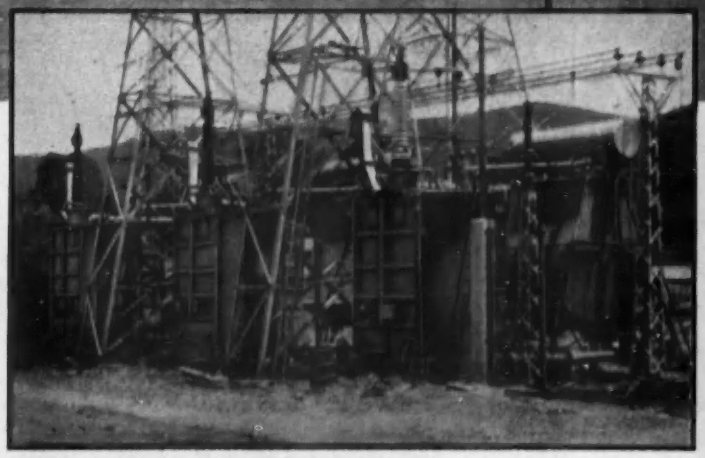

### THERMOSTATS — FOR AIR & GASES

MADE FOR VARIOUS TEMPERATURE RANGES. IN TWO TYPES:- ONE AS ILLUSTRATED WITH BRACKET FOR WALL OR CEILING MOUNTING WHEN USED AS A ROOM THERMOSTAT. ALTERNATIVELY WITH A CIRCULAR FLANGE FOR DUCT MOUNTING.
DETAILS GIVEN ON SECTION F8.

**HEATRAE LTD NORWICH ENGLAND**

MANUFACTURERS OF ELECTRIC WATER HEATERS · OIL HEATERS · IMMERSION HEATERS · URNS · TOWEL RAILS · AIRING CUPBOARD HEATERS · FLAMEPROOF HEATING APPARATUS BREAKFAST COOKERS ELECTRIC FIRES FOOD TROLLEYS · WARMING PLATES · AIR HEATERS ETC ETC

# ELEVEN



## 230 kV SINGLE-PHASE TRANSFORMERS

have been ordered for design and construction at our Walthamstow Works for despatch to Australia. They comprise the following :—

Four 230/72 kV units to form one three-phase bank with a spare unit, each with on-load Tap-Changer.

Seven 210/66 kV units to form two three-phase banks with a spare unit. The tanks of these transformers are for end-entry as no lifting facilities are available on site.

*The illustration above shows two units being prepared for Test at our Works; the inset photo shows the erection of the first bank approaching completion on site.*

FULLER

**FULLER ELECTRICAL & MANFG. Co. LTD.**
*Associated with ASEA Electric Ltd.*
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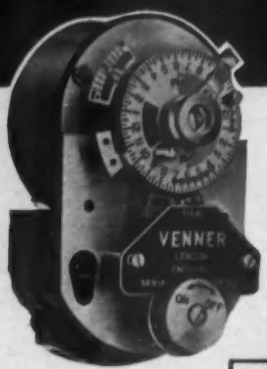
Phone: LARkswood 2350 (10 lines) Also at: BIRMINGHAM, GLASGOW, MANCHESTER, DUBLIN.

# floodlighting *AUTOMATICALLY* controlled

**Floodlighting is but one of the host of applications which Venner time switches control. Electrically wound, synchronous (with or without spring reserve), and up to 35 days hand wound switches are in use on the highways, in industry and in the home.**




Type MSSP with solar dial for automatically adjusting on and off times to allow for sunset and sunrise variations.

***For further information write for leaflet ET1.***

**VENNER LIMITED,** KINGSTON BY-PASS, NEW MALDEN, SURREY.

Telephone : MALden 2442.

*Associated Companies : Venner Accumulators Ltd., Venner Electronics Ltd.*

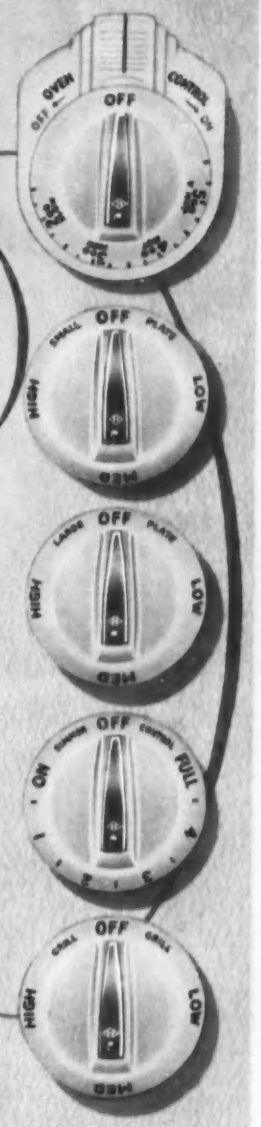
**VENNER**

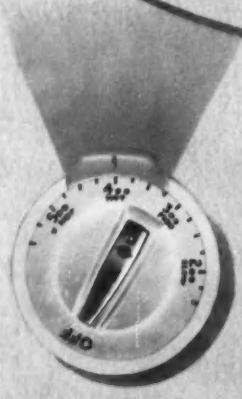
**TIME SWITCHES**

# 'DIAMOND H' bring COLOUR — TO COOKER CONTROLS

"Diamond H" recently introduced matched sets of streamlined push-on Handle Dials with metal inlays. These are now available in a wide range of colours to tone with or contrast to the colour schemes of modern Cookers and Kitchens.

These latest designs of "Diamond H" Switches and Thermostats are rapidly becoming standard equipment among all leading manufacturers of electrical appliances.



★ *"Diamond H" Switches Ltd. have specialised for 60 years in the manufacture of switches for all industrial and domestic appliances. You are invited to write for illustrated brochures which are available for all current production ranges.*

**'DIAMOND H' SWITCHES LTD.** GUNNERSBURY AVE., CHISWICK. LONDON. W.4.

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*These, an important addition to the F.B.C. range of ball and parallel-roller bearings, can save a manufacturer money and reputation:*

1 In design, giving you greater compactness: you don't have to allow room for a separate seal. The bearing is exactly interchangeable with standard F.B.C. and other bearings.

2 In machining; you don't have to machine a place for a seal, or provide a polished surface for the seal to ride upon.

3 In safety; this seal cannot form stress-raising scratches in your shafts.

4 The sealing ring is unaffected by ordinary lubricants, being of synthetic rubber. Seal can be on one or both sides.

5 You don't have to rely on some unknown user to lubricate the bearing.

*Further particulars on request.*

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F.B.C. : : FISCHER
*Ball and parallel-roller bearings*

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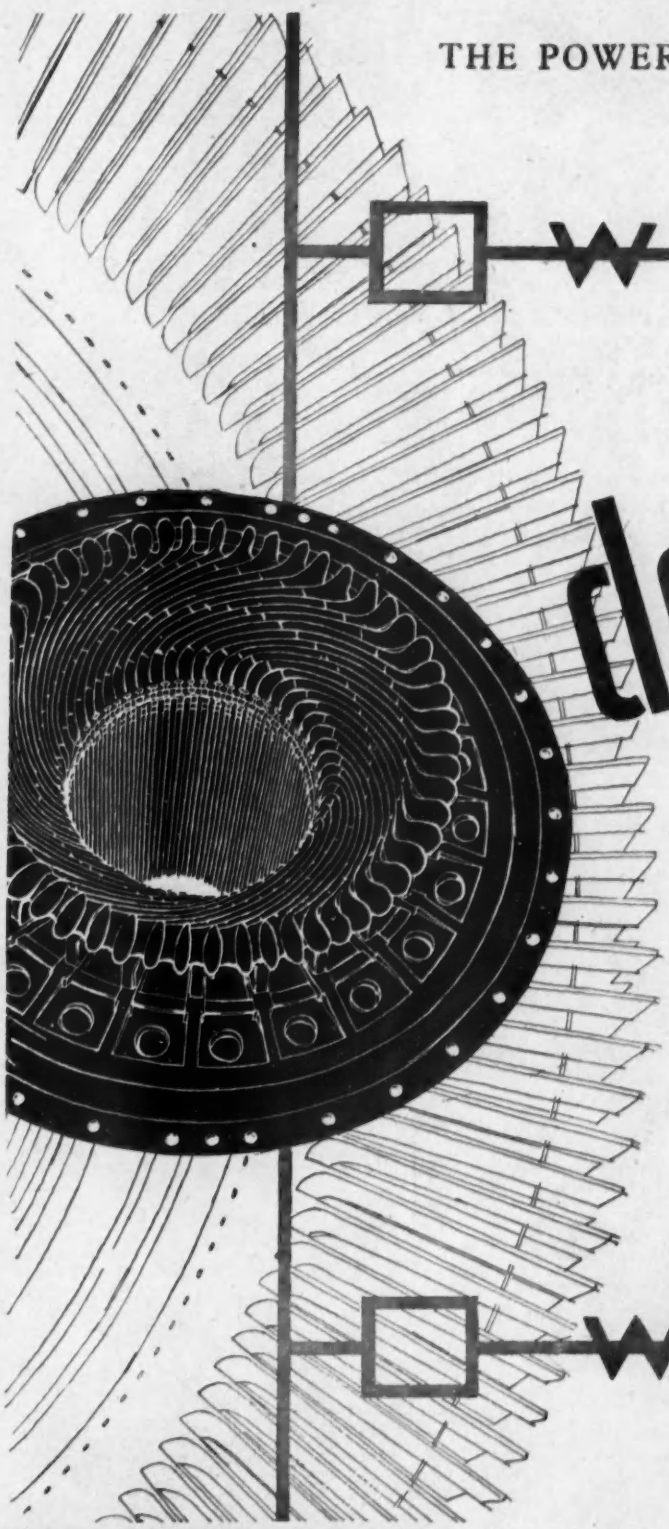
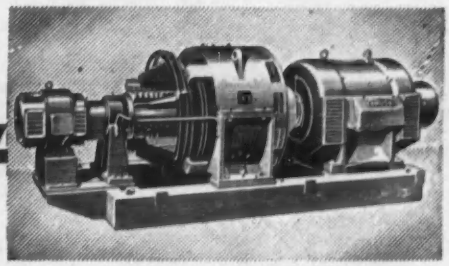
# THE POWER BEHIND BRUSH..



# design

Brush design engineers are constantly devising new and better ways of putting power into harness. Every Brush Power unit is designed *exactly* to do a job perfectly–if needs be 'tailor made' to a particular customer's requirements. Moreover, Brush Products are always designed to meet the maximum stress of their service life–not just to fill the requirements of a specification. In other words, it is creative design plus extra strength and *stamina* that makes Brush Power equipment famous throughout the world.



MOTOR GENERATOR SET *for High Duty Alloys Limited –190 H.P. 400/440 volts, 233 amperes–980 r.p.m. TR.544 Generator–120 kW 60 volts–2000 amperes–980 r.p.m.*

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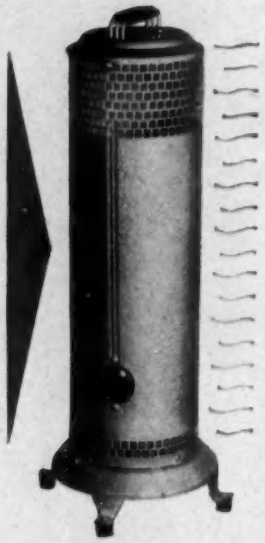

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One of the Group of Companies Associated with the Southern Areas Electric Corporation, Ltd.
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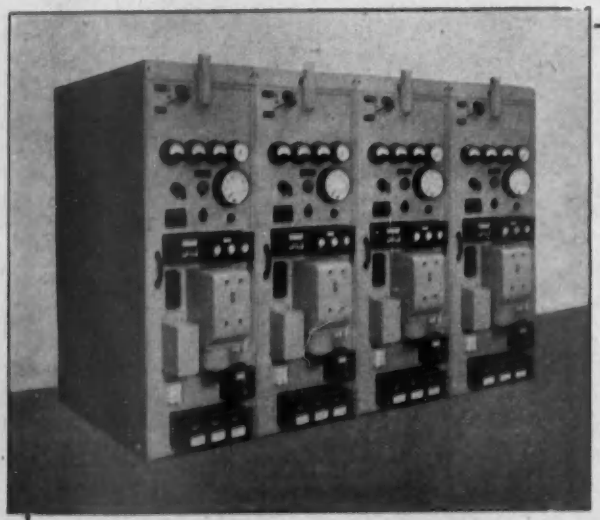
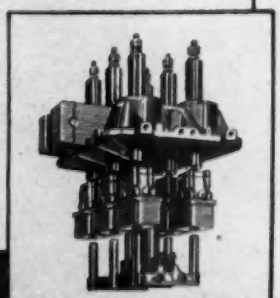


250 MVA
Switchgear
with
TYPE H. 25
oil circuit
breakers
6·6 & 11kV.



The switchgear is of the air insulated truck or fixed cubicle pattern. The oil circuit-breakers are A.S.T.A. certified and may be arranged for hand, spring or solenoid operation. They can be supplied as loose units for the replacement of obsolete breakers.

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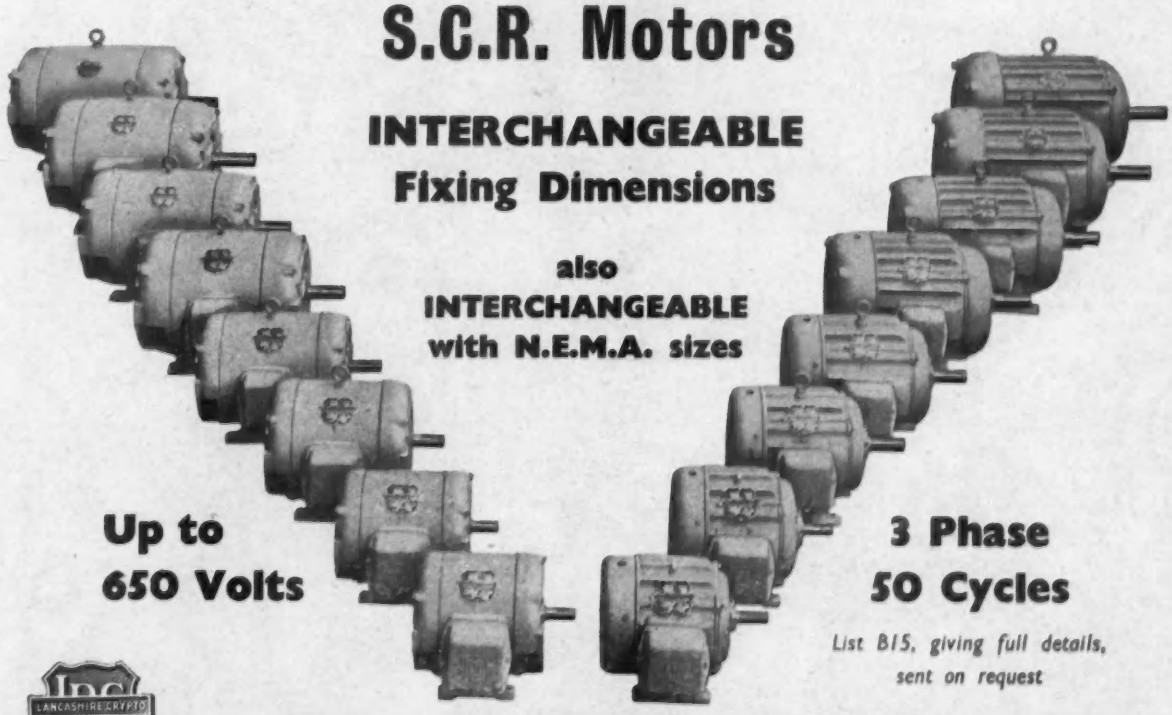

**Up to**
**650 Volts**

**3 Phase**
**50 Cycles**

*List B15, giving full details, sent on request*

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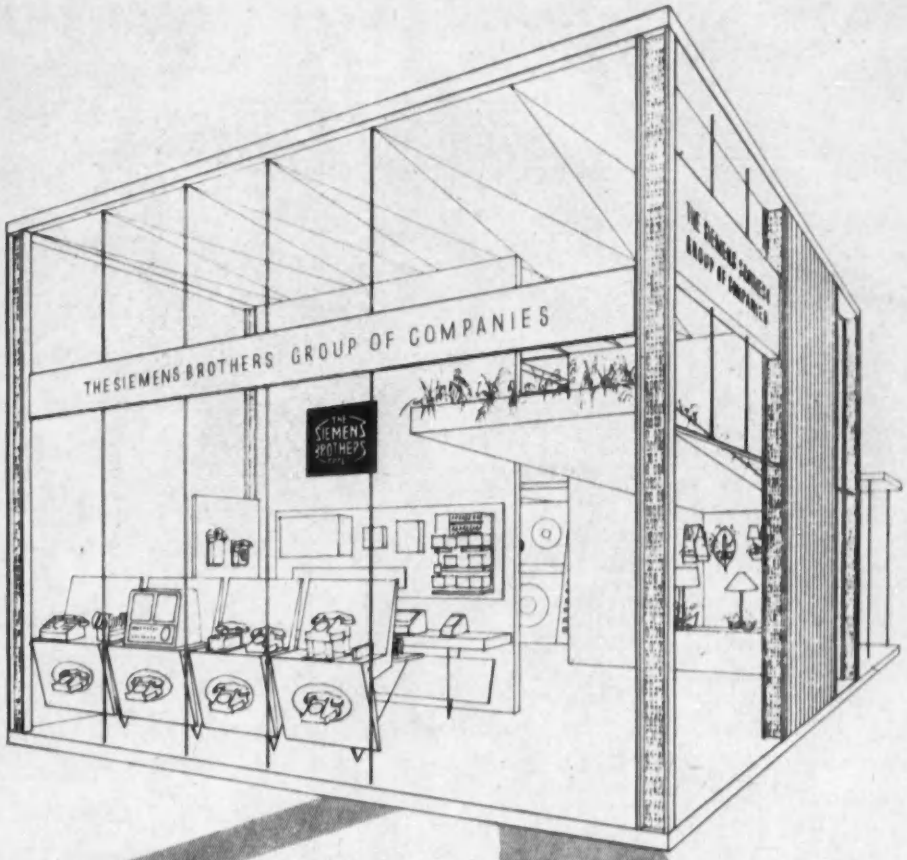


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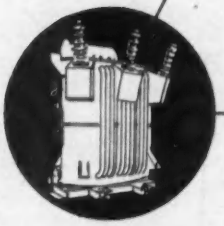
# Silence is not golden

Amid chattering machines and in the bedlam of the machine-shop, men are diligently working; in the office above with its rumbling floor, men are diligently working. Then, silence: silence where a cough sounds like a thunder-clap as precious seconds tick by; seconds that mean money in terms of production—seconds that can be ill-afforded as men repair the electrical break-down.

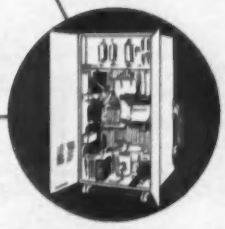
Don't let this happen to you. Choose wisely: choose Davenset transformers and rectifiers—you can depend on them.



**TRANSFORMERS UP TO 500 kVA**

*Rural distribution, electric furnaces, machine tool lighting, low voltage hand tools, power packs, soil heating and for every possible industrial application employing transformers.*

**DAVENSET**



**RECTIFIER EQUIPMENT UP TO 100 kW**

*Battery chargers, mercury arc rectifiers, rectifiers for electroplating, cathodic protection, engine starting, D.C. solenoids, crack detectors, variable speed D.C. drives, etc.*

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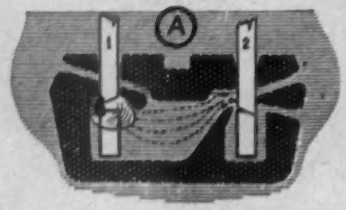
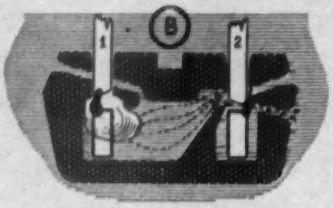
# THE "CATON" ARC TRAP CIRCUIT BREAKER

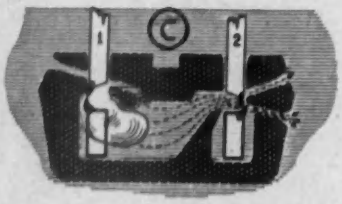
*(Potents pending)*



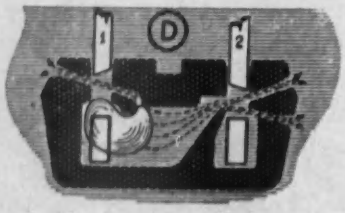

No. 1. Electrode leads by ¼ cycle. Pressure trapped except for constricted relief at No. 2 in advance of arc.



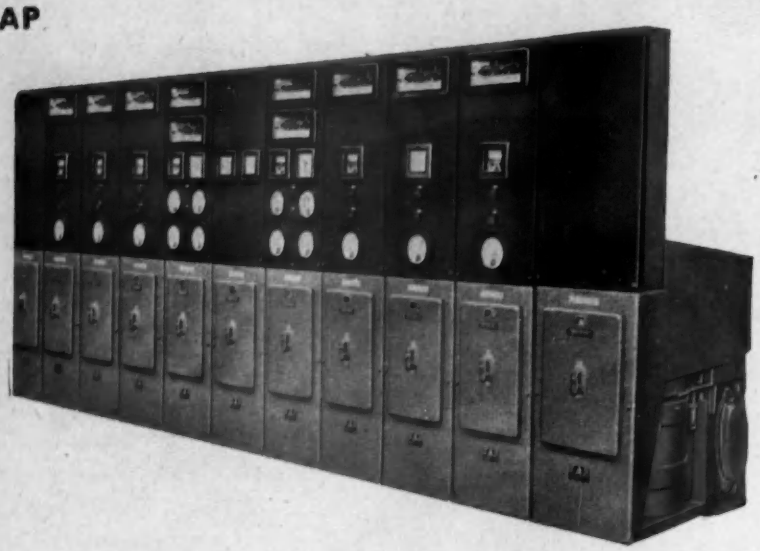

No. 2. Electrode breaks contact. Arcing restricted and displaced by pressure.

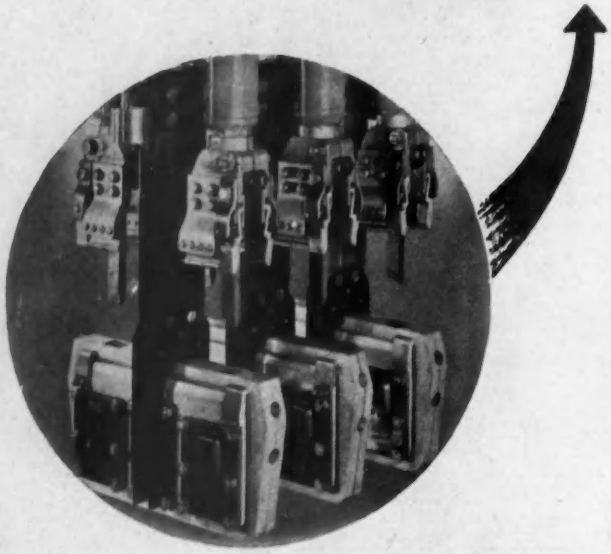



Arc severed at current zero by high pressure clean oil




Arc-trapping device scoured by exhausting pressure and rapidly refilled with clean oil





Typical 11 kV 250 MVA IVI switchboard embodying arc trapped circuit breakers for important industrial substation.

*(Also supplied for outdoor use)*

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# YORKSHIRE SWITCHGEAR

## & ENG. CO. LTD.

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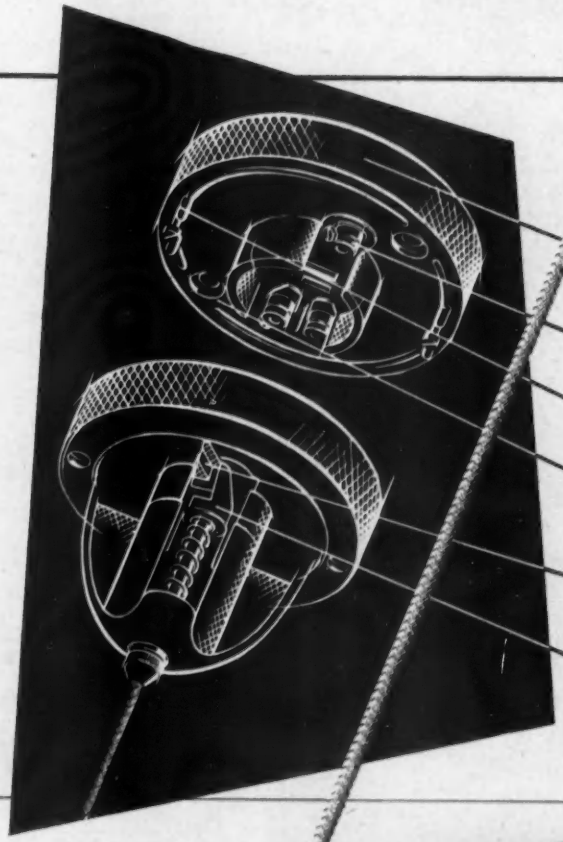
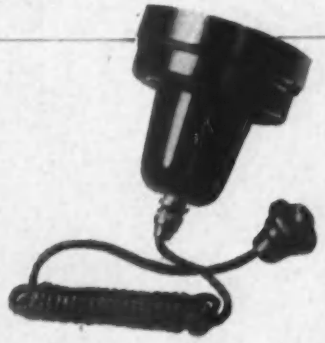
# a new 'ROLAC' ceiling switch



**That this switch is an advance on previous designs is clearly evident from the diagram. The electrical efficiency and workmanship are of the highest order and ensure long life.**

- *Ample wiring space under the switch-base with knockouts opening into switch interior enables easy compliance with 12th Edition Wiring Regulations.*
- *Sensibly sized terminals with well fitting grub screws directly attached to silver faced contacts.*
- *Brass inserts in the base ensure maximum security of the cover-base fixing screws.*
- *Ample Bakelite around fixing screw holes to ensure that the moulding will not fracture on maximum possible stress in use.*
- *Floating solid bar contact for maximum heat dissipation; giving the shortest possible path through switch, as well as an ingenious patented two-way action.*
- *This switch has the proved ROLling A.C. action of the smaller version, 'ROL-AC', which is now available in greater numbers.*



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Motor Control Gear · Electro-magnetic Devices

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# 260 feet a day...

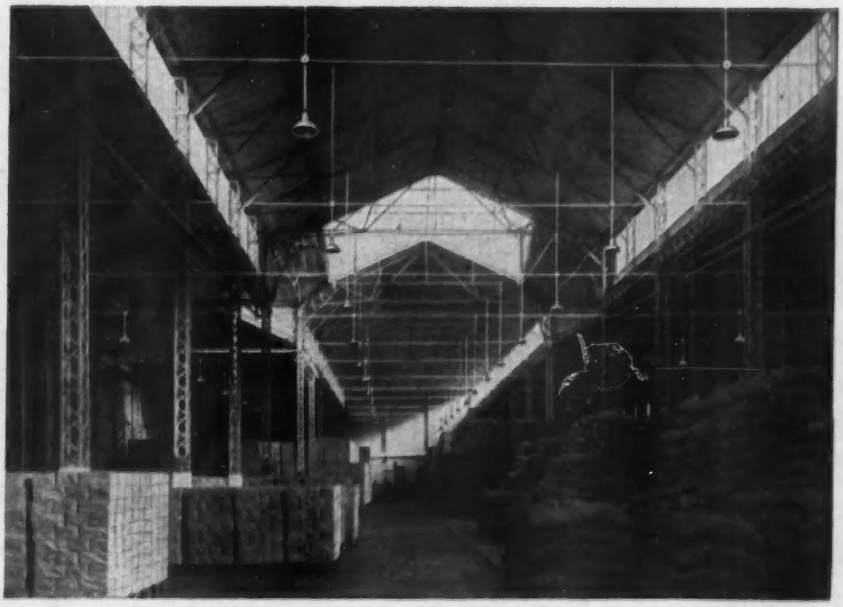
A MOST INTERESTING history is attached to this extensive new store recently erected by Tate & Lyle Limited at their Plaistow Wharf.

The original building was situated on the old White City Exhibition ground. All the steel work was dismantled, transferred to Plaistow, renovated, re-painted and re-erected, thus providing additional warehouse space in quick time and without the many problems of obtaining new materials.

Similar economies were achieved in the provision of a good all-round general illumination. From the nature of the structure it would have been a formidable and costly job to install conduit throughout the building, on account of the great height of the building and the consequent length of the droppers necessary to mount the light fittings.

By using ENFIELD GRID SUSPENSION SYSTEM the electrician concerned erected 260 feet a day, including 8 light fittings and 2 feed points. This was twice as fast as any type of conduit installation and represented a great economy in time and materials.

Moreover, the electrician and his mate had never before used Grid Suspension, but after their first experience they had no difficulty in installing more than 260 feet a day when they started on a second warehouse nearby.



*Another triumph for Mr. Cube and an Enfield product*

*Don't fail to visit*
**STAND 86**
**ELECTRICAL ENGINEERS' EXHIBITION**
Earls Court, London, S.W.
Mar. 15th to 19th

**ENFIELD CABLES LIMITED, VICTORIA HOUSE, SOUTHAMPTON ROW, LONDON, W.C.1**

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8.32

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**MAIN SWITCHBOARD AND DISTRIBUTION BOARDS CHOSEN FOR THE NEW EXECUTIVE OFFICES OF RENOLD CHAINS LTD.**

Dorman equipment was selected for Renold House, the new central selling and administrative building of Renold Chains Ltd. The main switchboard and distribution boards were specially designed by our technical staff and constructed by the Switchgear Division at our Manchester works. It is a source of some pride that the reputation which Dorman equipment has gained amongst leading authorities has been further enhanced by this important new installation.

**DORMAN PRODUCTS INCLUDE :—**

Air Break Fused Switches, Generator and Alternator Control Boards, Distribution Fuse Boards, Crane Control Panels, Air Circuit Breakers, Miniature Circuit Breakers, Switch Plugs, Controlled Distribution Lighting Fittings, Cluster Lighting Fittings, Bulkhead Lighting Fittings, H.R.C. Cartridge Fuse Links.

# DORMAN & SMITH LTD.

THE WORLD'S BEST L.T. SWITCHGEAR

MANCHESTER 5 and also at LONDON, GLASGOW, BELFAST and JOHANNESBURG

See our Exhibits at the ELECTRICAL ENGINEERS EXHIBITION, Earls Court, March 15th to 19th, STAND 199

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PORTABLE TIME RECORDER

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The J.M.C. Clipper prints on the face of the card—where the name appears—recording arrivals, departures and job process times on and off.

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Manufacturers of laminates for electrical insulating and general engineering uses—rail track insulation—stay wire insulators, S.R.B.P. Tubes, H.V. Bushings and Terminals.

*Down Alton way,* when a fellow cycles home from work, the woods and fields and streams he sees are those his father knew. The people who lift a hand and exchange a word as he passes are people he knows and knew as a boy. He's a man with a name and a home and a place in his own community: and he feels—who wouldn't?—that life's the better for that. And the batteries men like him are making in Alton? Well, a storage battery is among the most tightly specified, uniform products made. And yet, year after year, come letters telling us our batteries serving overseas have a certain distinguishing overall merit of their own. It could be that what a life that's better than merely worth living puts into a man, comes out in the form of work which is just that vastly important bit better than 'up to specification'.

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A.29

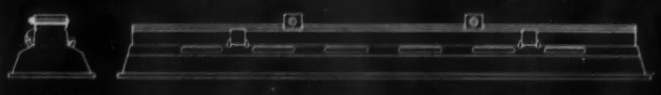
Behind every massive production effort there is a story of a lighting problem solved. In this aircraft wing assembly bay, the need for even, well diffused lighting on all working surfaces was paramount. This factor had to be related to efficiency, economy in installing and operating the system, and minimum interruption for maintenance.

## successful co-operation solves a major lighting problem.

The solution was an effective demonstration of the success attending the free exchange of inspiration and experience between the contractor and Atlas lighting engineers, a service willingly extended to include your lighting problems, large or small.

*In this huge assembly bay in one of Britain's foremost aircraft factories are installed nearly four hundred Atlas F.K. Industrial fluorescent fittings. Each houses two 5 ft. 80w. Atlas White tubes in a closed end trough. Upward lighting is provided by slots in the reflectors, which are completely detachable for cleaning and "Miracoat" finished for protection against damp and corrosion.*

*Electrical Contractors: Alliance Electrical Company Limited*



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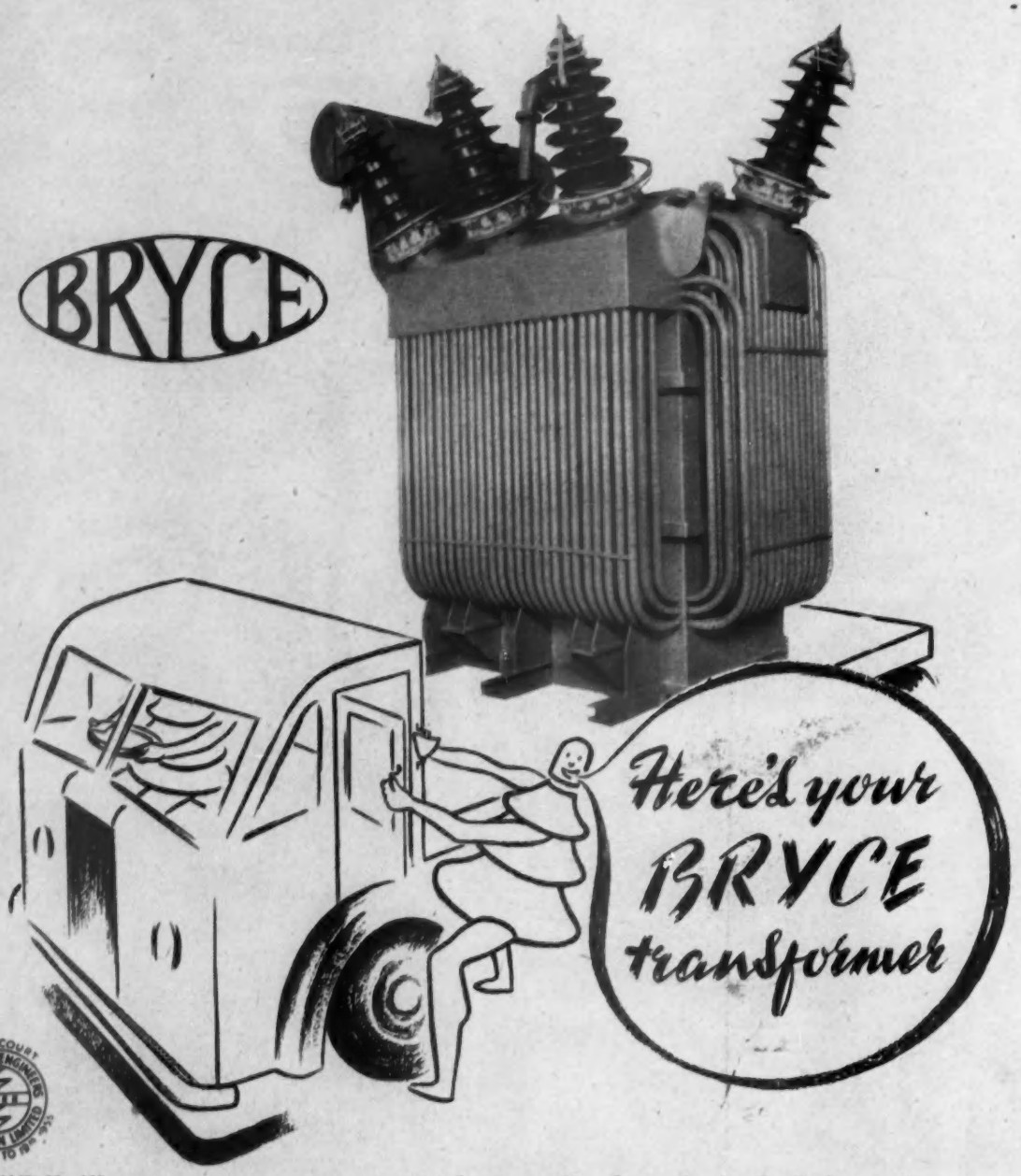


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# PROGRESS IN CONTROL

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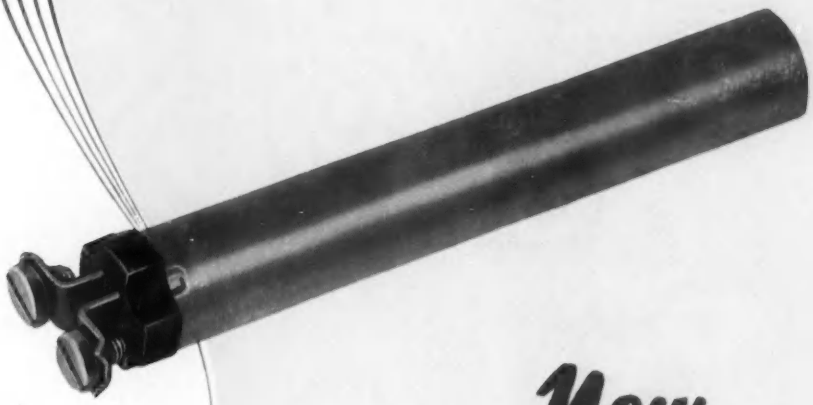

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*Manufacturers of the Simmerstat, Oven Thermostats, Radiant Hotplates and Pneumatic and Electrical Instruments for detection, measurement, control and recording of Temperature, Flow, Liquid Level, Specific Gravity and Pressure, in Science and Industry. Vacuum Pumping and Measuring Equipment, etc.*
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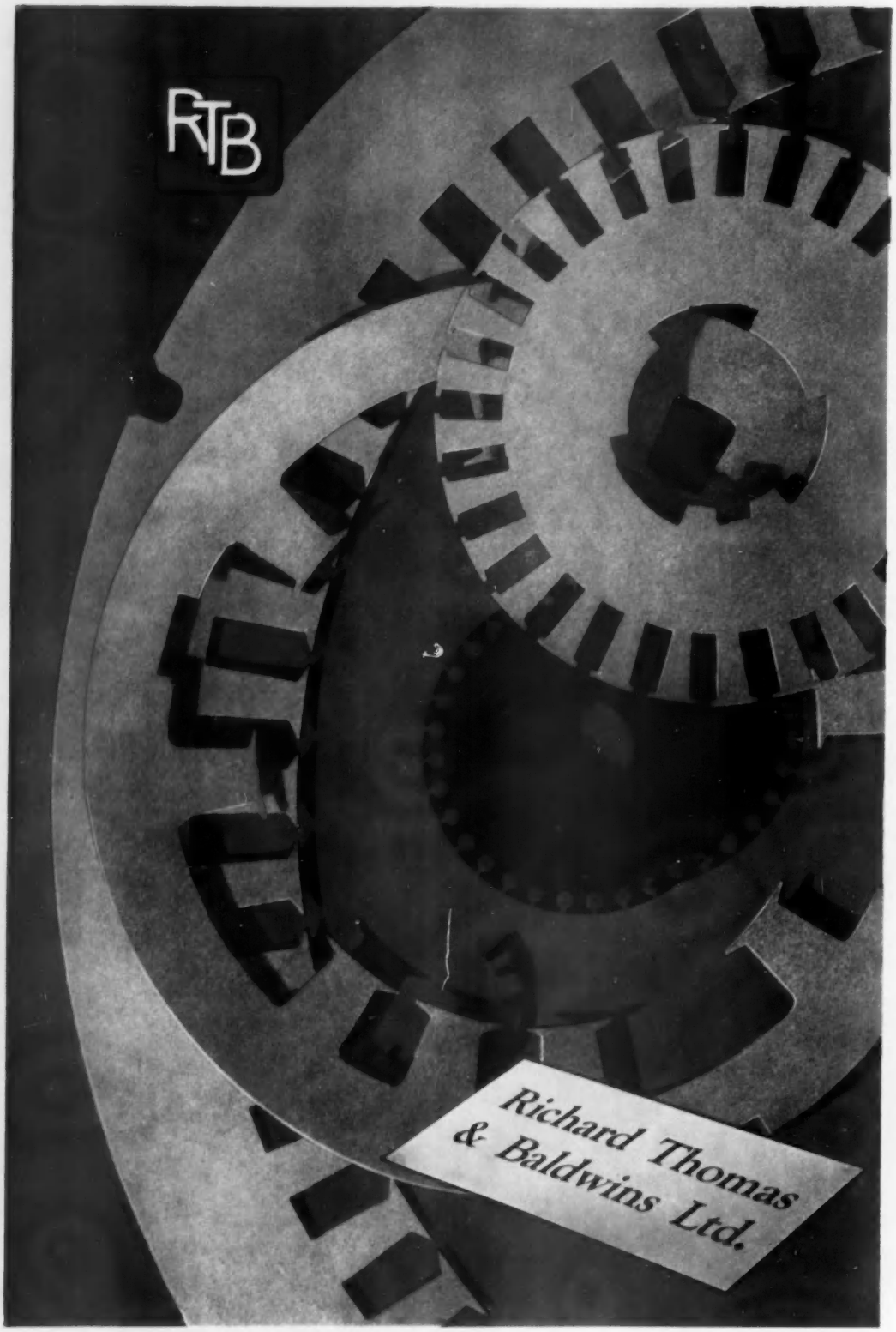


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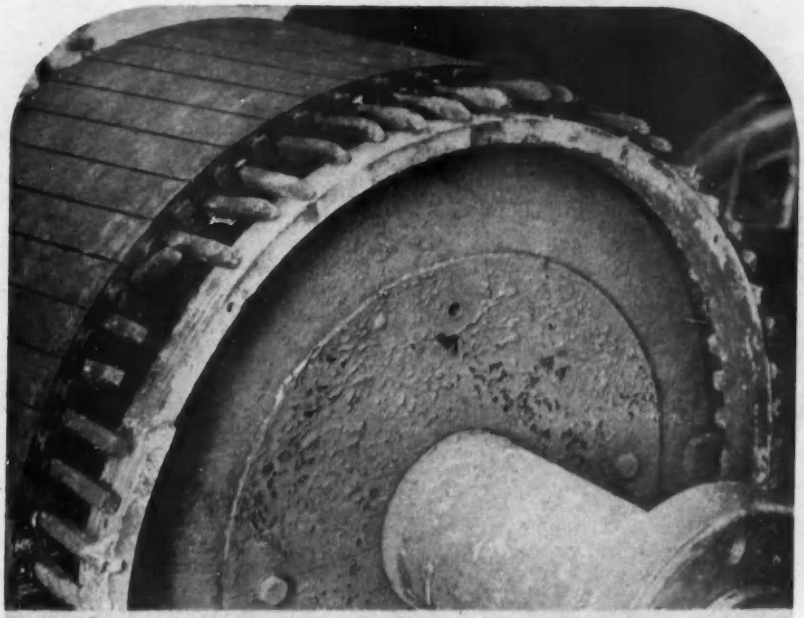

A motor's performance and reliability depend more upon the rotor than upon the stator, because the rotor is a moving part. The prevention of a breakdown like this concerns us as much as the repair.

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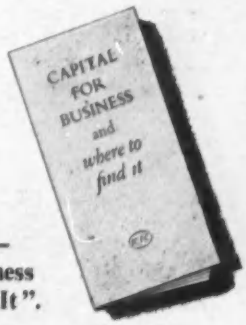
ICFC capital has changed the picture for many industrial organisations by financing new buildings, new plant and schemes of general expansion. The Corporation provides finance in the form of long-term loans on fixed terms, or share capital, to industrial and commercial enterprises in Great Britain. Amounts range normally between £5,000 and £200,000. Formed in 1945 by the English and Scottish banks, ICFC has already aided the expansion of British industry by loans totalling over £40,000,000.

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NEW DAY

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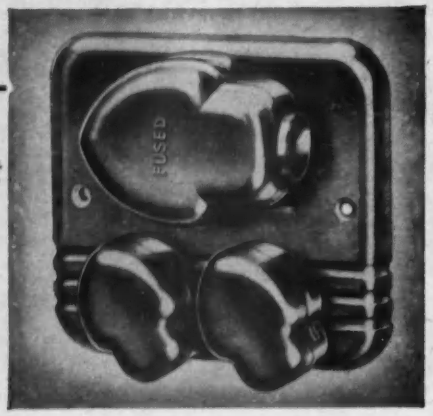
*The Fireside Triple Socket*

- The only accessory of its kind available
- Installation costs cut to ¼
- Three points from only one box—*one 13-amp BSS 1363 Shuttered outlet and two 2-amp BSS 546 Outlets.* Plus a fused spur terminal for additional socket outlets
- Eliminates unsightly adaptations.

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*One of the group of Companies associated with the Southern Areas Electric Corporation Ltd.*

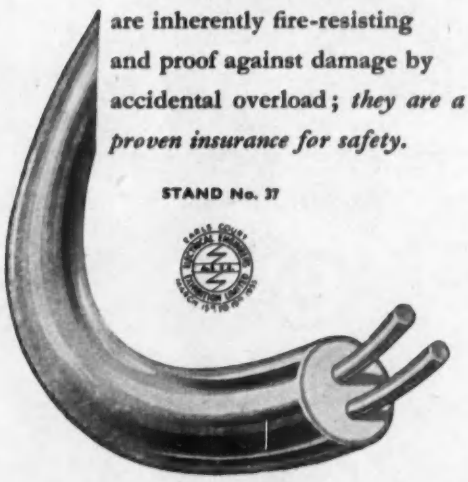
# it's SAFE to say "Pyrotenax"

COPPER COVERED MI CABLES

The use of the trade name 'Pyrotenax' is exclusive to the products of this Company and its associates.

**The unique characteristic of 'Pyrotenax' cables is that they are made wholly and solely of copper and a mineral insulant. Oil, water, condensation—nothing will affect them. Above all they are inherently fire-resisting and proof against damage by accidental overload; *they are a proven insurance for safety.***

STAND No. 37



*There are also the Pyrotenax*

**M.I. WARMING CABLES**

*for low temperature heating of*

FLOORS
TANKS and
PIPES, etc.

These high thermal efficiency cables possess the same desirable characteristics of the standard Pyrotenax Cables, and like them, are **INHERENTLY SAFE.**

*Enquiries regarding specific applications are invited.*

## because they are

**NON-FIRE CAUSING**

Insulation is non-inflammable and cannot be ignited. 'Pyrotenax' is fully approved for Group II and III flame-proof conditions.

**HEAT RESISTING**

'Pyrotenax' will operate at temperatures up to 250°C. continuously and 1,000°C. temporarily and will continue to carry current at normal voltages at these temperatures.

**MOISTURE PROOF**

Unaffected by moisture or hot humid atmospheres, there are no condensation problems with 'Pyrotenax'.

**NON-AGEING**

The complete structure of core, sheath and insulant is absolutely stable under heat, moisture and sunlight—the insulant cannot 'track' due to leakage currents.

**CORROSION PROOF**

Copper, of all the metals in common use, is the least affected by general corrosion; thus 'Pyrotenax' is proof against the normal corrosive influences found in buildings, factories, ships and docks; and in plaster, concrete and most soils.

**OF HIGH CURRENT CARRYING CAPACITY**

The high thermal conductivity of the compressed insulant permits current carrying capacities much in excess of those normally experienced.

**RESISTANT TO MECHANICAL MALTREATMENT**

The tough pliable sheath and highly compressed insulant permit Pyrotenax cables to withstand violent twisting, pulling, bending, and straightening, or severe blows, without impairing their efficiency.

*A non-technical description of 'Pyrotenax' is given in our booklet "Current Carrying". For the technical man "Technical Data" is available — write for your copy.*

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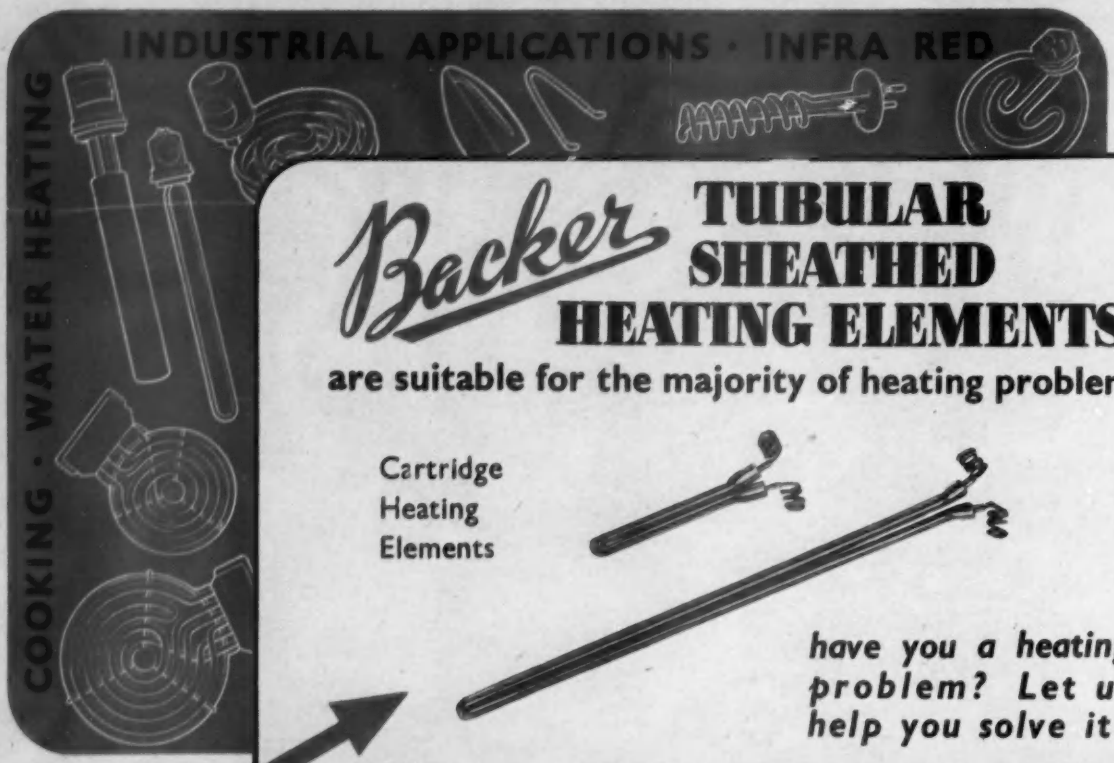


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**TUBULAR SHEATHED HEATING ELEMENTS**

**are suitable for the majority of heating problems**

Cartridge Heating Elements



*have you a heating problem? Let us help you solve it!*

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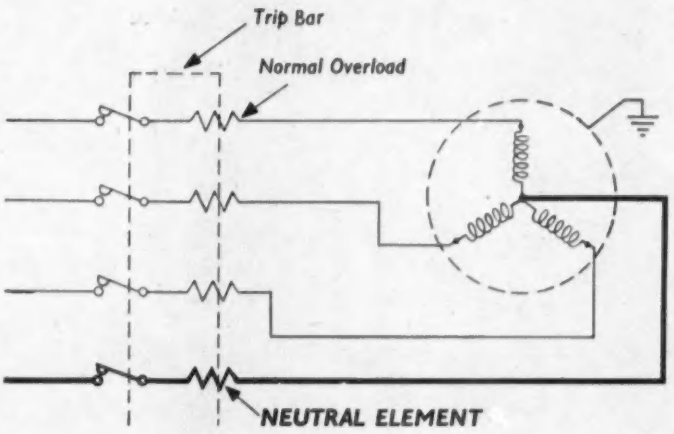
and BRANCHES.

# Protection

## for 3-phase f.h.p. motors

## against all faults...




## including single phasing

The new 'ENGLISH ELECTRIC' protection system for three-phase f.h.p. motors provides inexpensive and RELIABLE protection against ALL faults, including single-phasing.

This system, which is based on the flow of current in neutral when a fault occurs, is particularly suitable for group installation of f.h.p. motors, for which protection against single-phasing has previously been ruled out for economy reasons.

It is being demonstrated at the A.S.E.E. Exhibition, and is fully described in Publication FP/161, which is available on request.

# 'ENGLISH ELECTRIC'

**STAND No. 41 A.S.E.E. EXHIBITION**

where 'ENGLISH ELECTRIC' are also showing: Fusegear, Industrial Motors, Instruments, Meters, Relays, Switchgear, Transformers and Industrial Actuators.

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

*F.H.P. Motors Department, Bradford*

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

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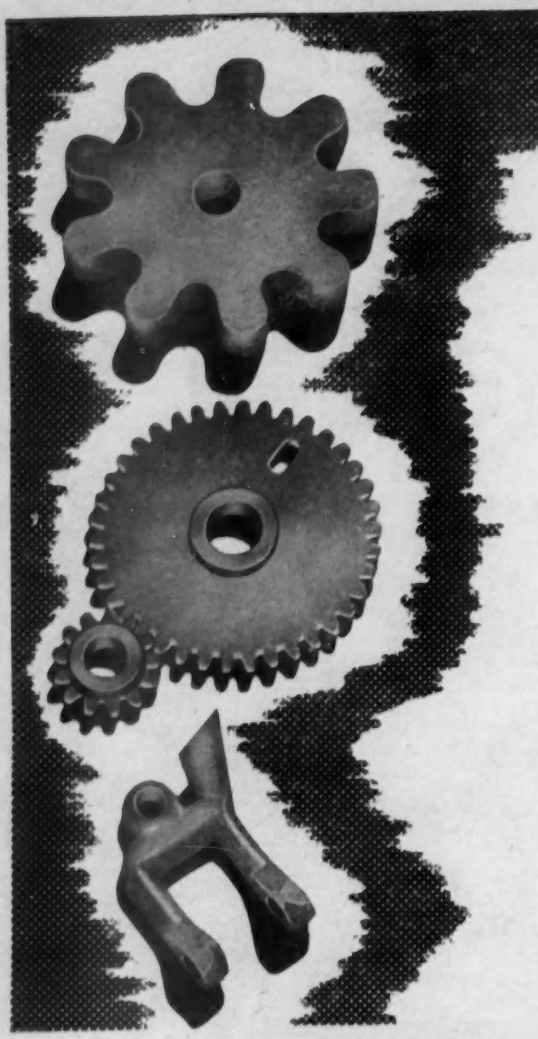
# To be precise...



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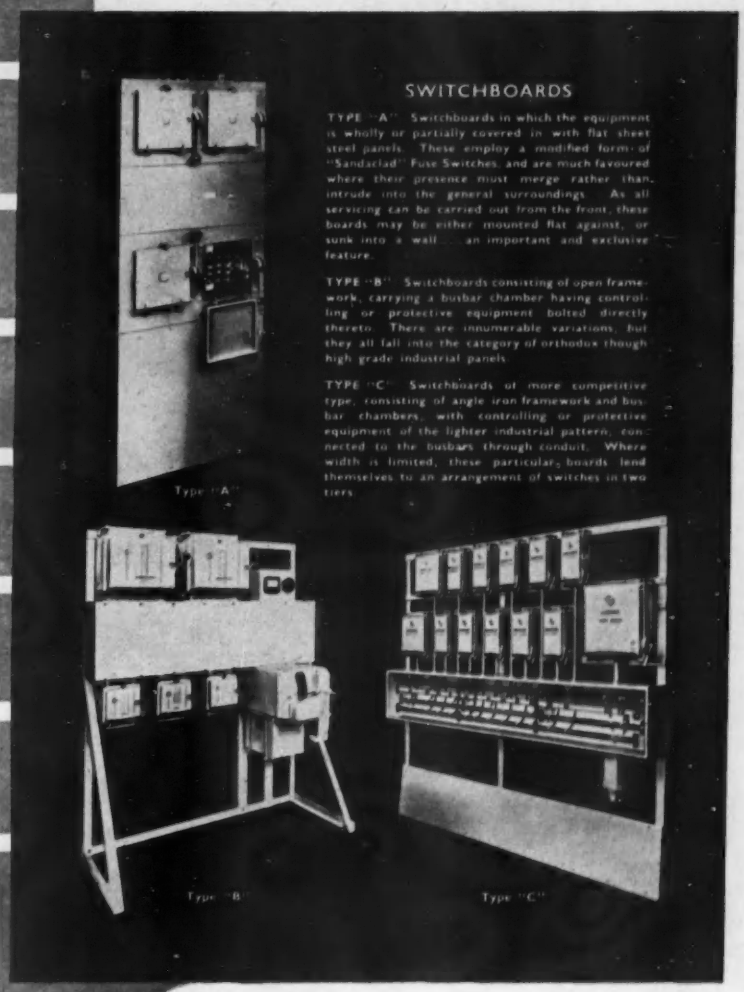
# A page from SANDERS comprehensive Catalogue


SWITCHBOARDS
TYPE "A" Switchboards in which the equipment is wholly or partially covered in with flat sheet steel panels. These employ a modified form of "Sandaclad" Fuse Switches, and are much favoured where their presence must merge rather than intrude into the general surroundings. As all servicing can be carried out from the front, these boards may be either mounted flat against, or sunk into a wall . . . an important and exclusive feature.
TYPE "B" Switchboards consisting of open framework, carrying a busbar chamber having controlling or protective equipment bolted directly thereto. There are innumerable variations, but they all fall into the category of orthodox though high grade industrial panels.
TYPE "C" Switchboards of more competitive type, consisting of angle iron framework and busbar chambers, with controlling or protective equipment of the lighter industrial pattern, connected to the busbars through conduit. Where width is limited, these particular boards lend themselves to an arrangement of switches in two tiers.
Type "A"
Type "B"
Type "C"

**See the actual products on STAND 77**

**A.S.E.E. EXHIBITION**
**EARLS COURT**
**MARCH 15th - 19th**

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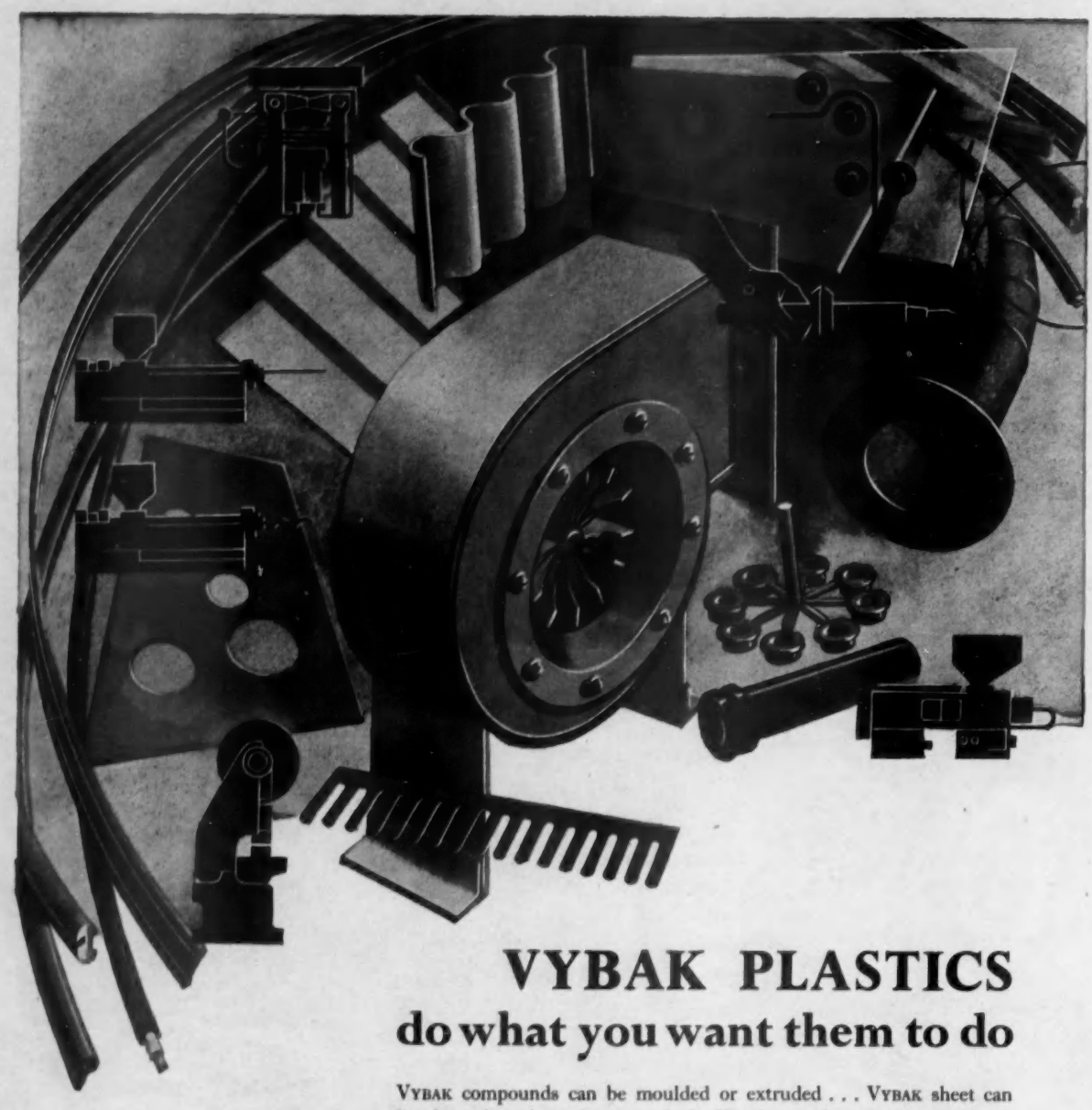
WM. SANDERS & CO. (WEDNESBURY) LTD., WEDNESBURY, STAFFS.



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- *Moulding or extrusion compounds—rigid and flexible.*
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- *Vybak PVC-A Copolymer Resins.*

VYBAK Plastics

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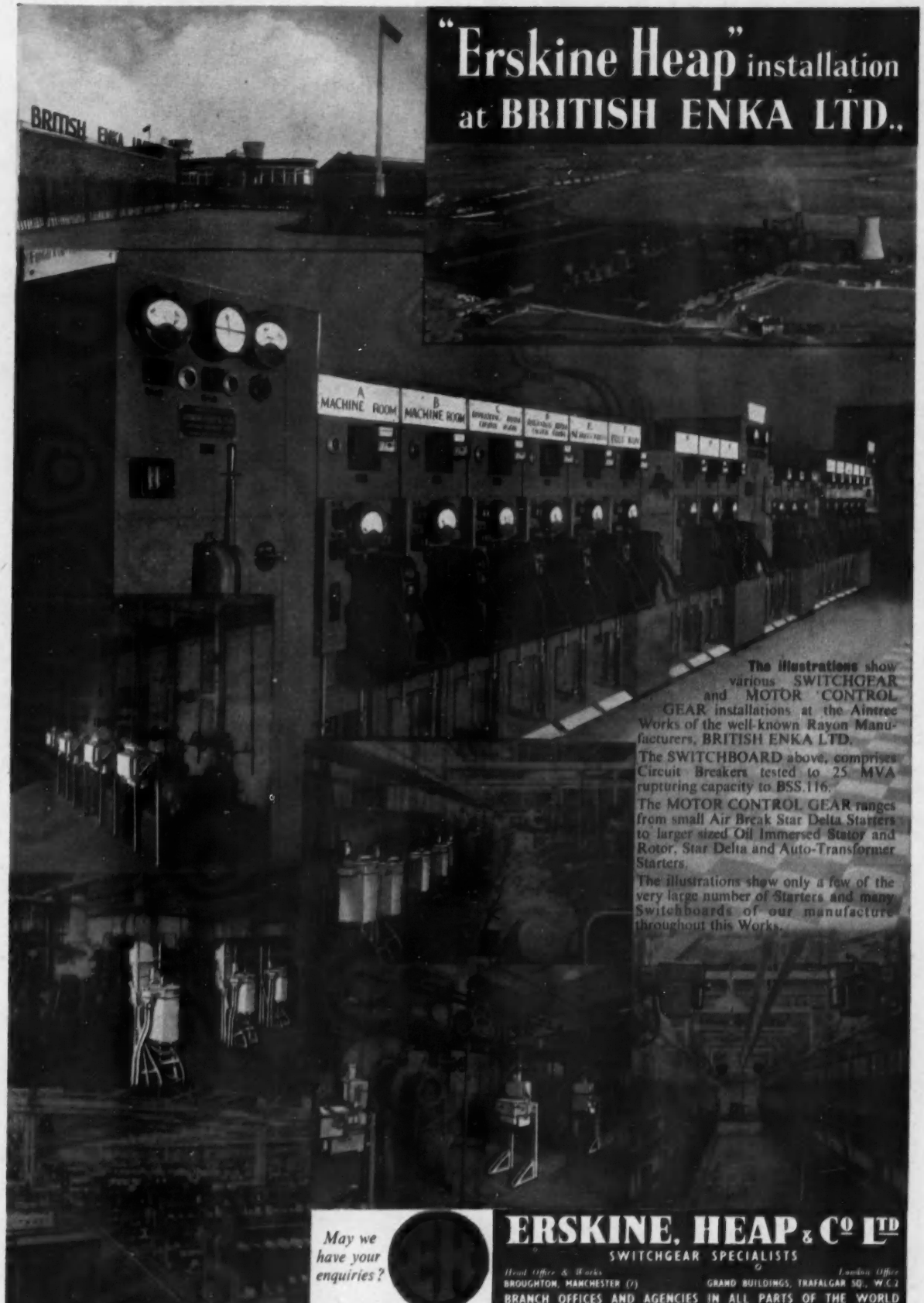
VP33

# "Erskine Heap" installation at BRITISH ENKA LTD.,




**The illustrations** show various SWITCHGEAR and MOTOR CONTROL GEAR installations at the Aintree Works of the well-known Rayon Manufacturers, BRITISH ENKA LTD.

The SWITCHBOARD above, comprises Circuit Breakers tested to 25 MVA rupturing capacity to BSS.116.

The MOTOR CONTROL GEAR ranges from small Air Break Star Delta Starters to larger sized Oil Immersed Stator and Rotor, Star Delta and Auto-Transformer Starters.

The illustrations show only a few of the very large number of Starters and many Switchboards of our manufacture throughout this Works.

*May we have your enquiries?*

**ERSKINE, HEAP & Co LTD**

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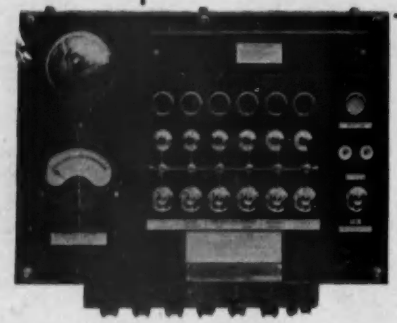

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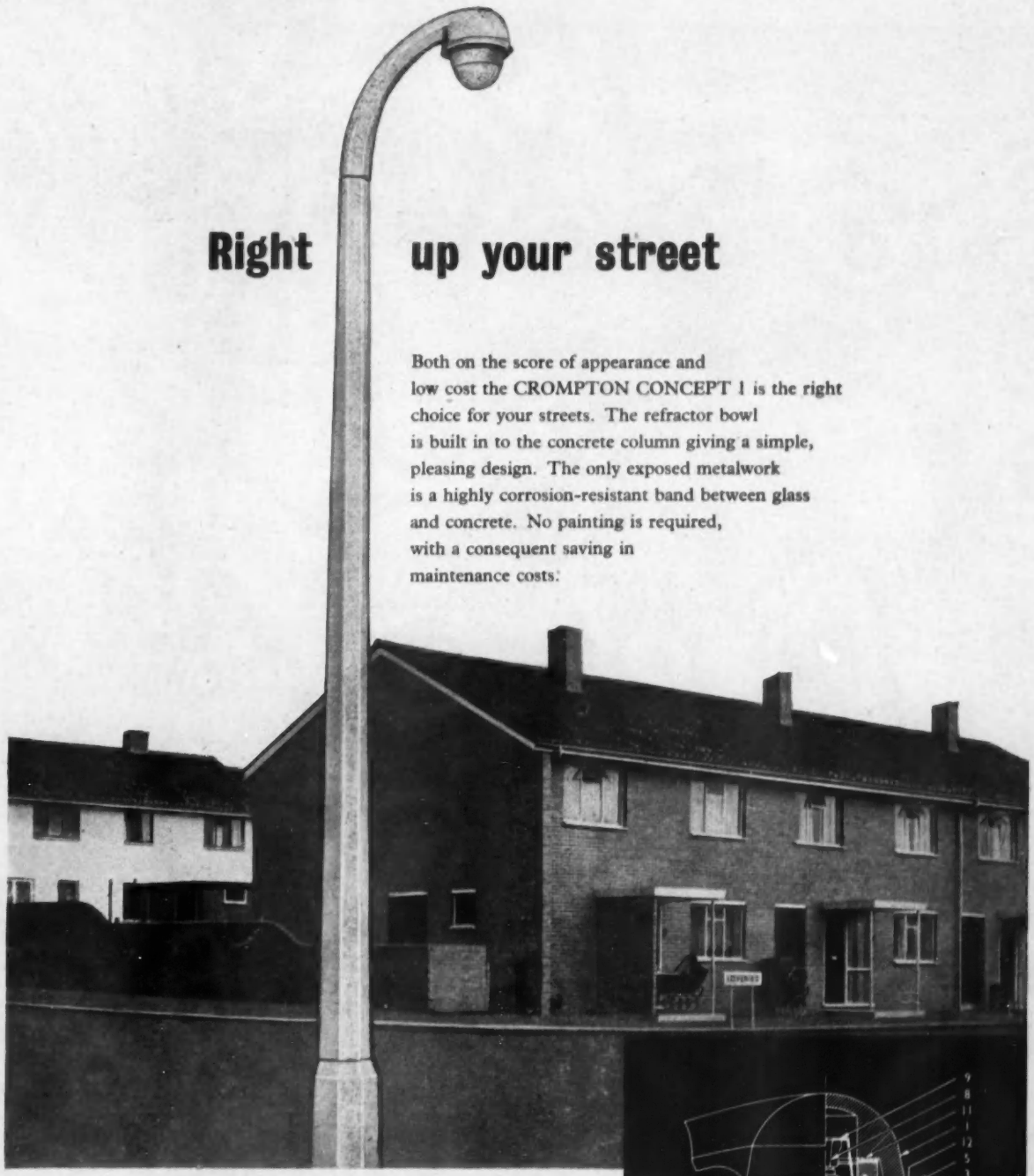

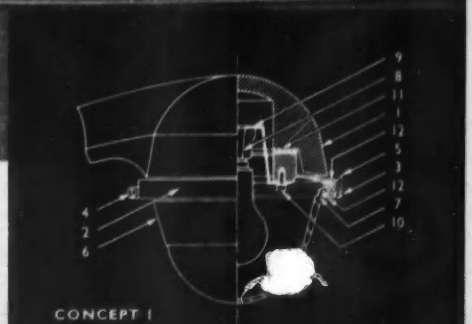


CONCEPT 1

*For side-road lighting with tungsten (100/200 w.) or mercury lamps (80/125 w.)*

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3 Bowl ring hinged to (2)
4 Self-retaining hinge bolt
5 Toggle clip
6 Prismatic glass bowl
7 Bowl retaining clips
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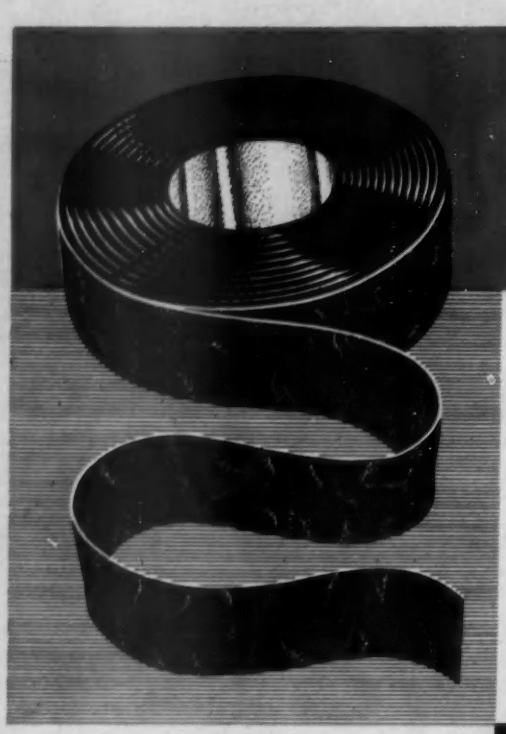

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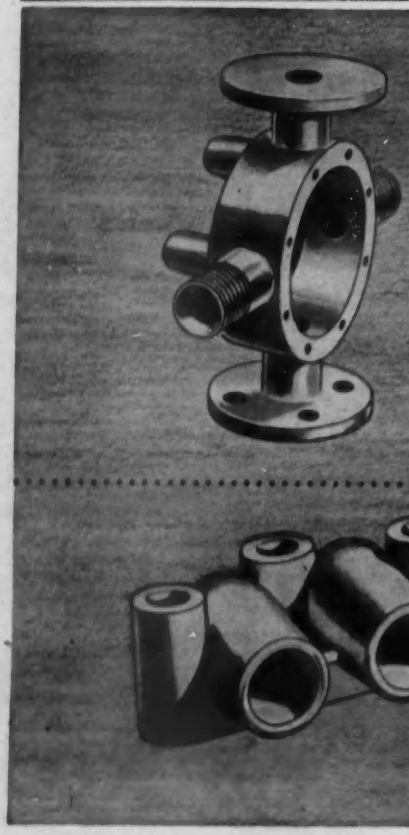

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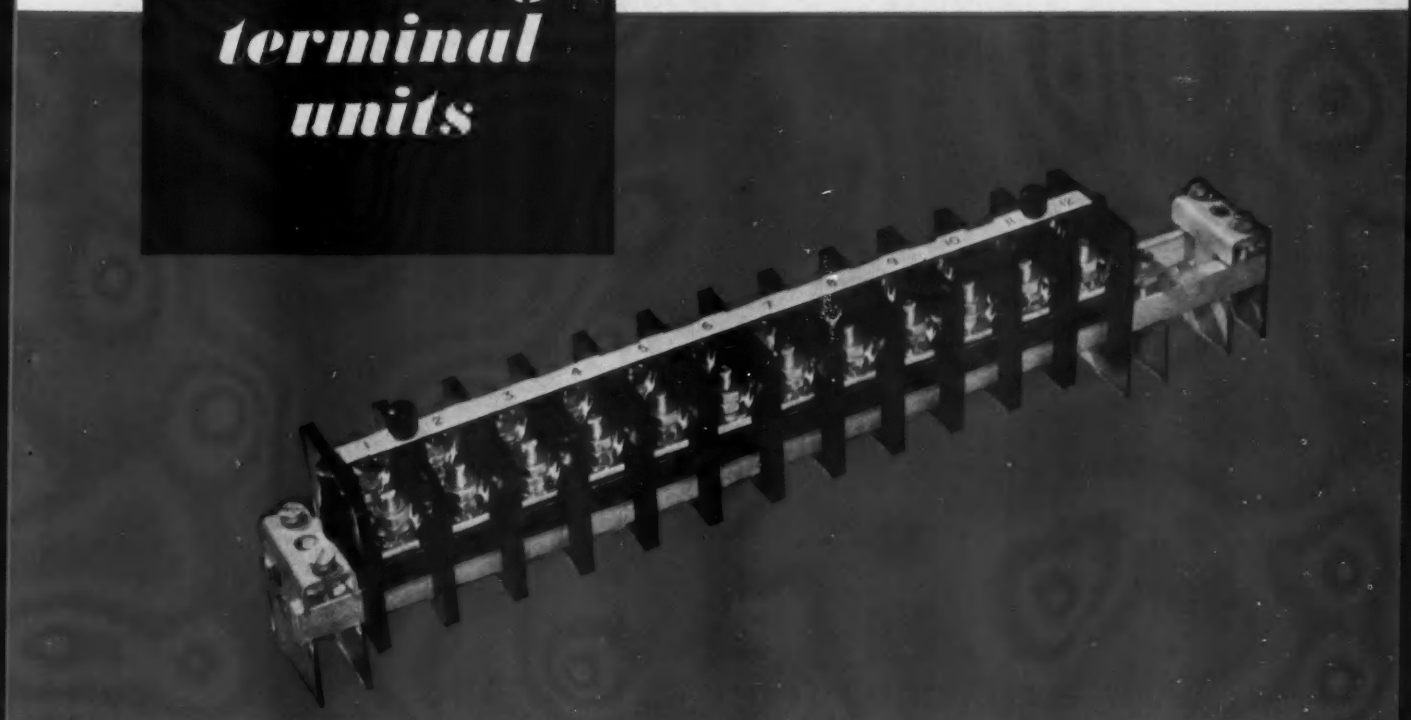
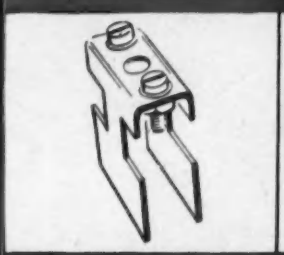
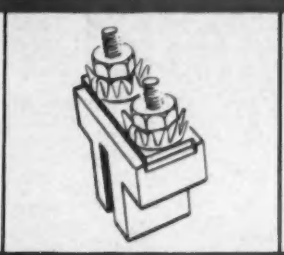
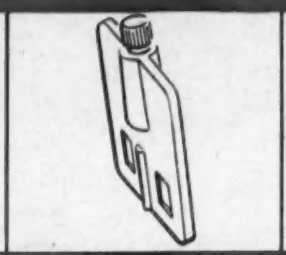
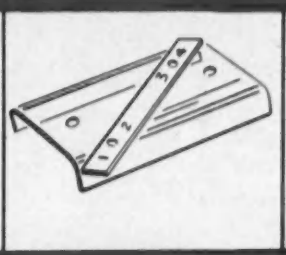
# ASTRAL *multiway terminal units*

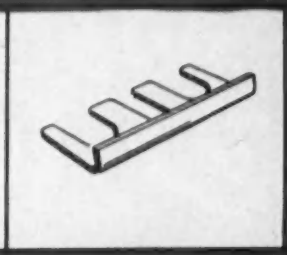












***APPLICATIONS*** Cable terminations, interconnections and testing. L.T. systems, switchboards, control equipment, traction, etc.

***DESIGN*** Any number of terminal ways, built from eight basic types of interlocking components. No live metal underneath, and room to pass cables under. Framework earths. Optional, bridging links, two, three or more ways. Supplied assembled and co mplete, or in parts to order.

***MATERIALS*** Terminal pillars on solid plates, all nickelled brass, each pair on heavy moulded black phenolic segments, with separate barriers, all locking into position. Cadmium plated steel support bars, brackets and screws. Optional, nickelled copper bridging links.

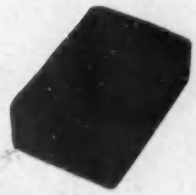
***DIMENSIONS*** Overall height 3¾″, width 2″. Length, two-way 5$\frac{13}{16}$″ increasing $\frac{13}{16}$″ for each additional terminal way, example, twelve-way 14$\frac{13}{16}$″. Two $\frac{3}{16}$″ fixing holes at centres ½″ less than overall length. Steel support bars ½″ x ¾″.

***TERMINALS*** Rating 60A. 660V. Each separate segment has two No. 0 B.A. Pillars, with lock nuts and claw terminals, or cable sockets if specified. Each interlocking segment can be separately removed, for easy connecting.

***SHIELD & LABEL*** Optional. Both separately detachable, secured by insulated screwed knobs. Rigid transparent P.V.C. shield. Ivorine label supplied blank, or numbered lettered per terminal way to order.

***INSTALLATION*** Units up to twenty-four ways, fixed with two No. 0 B.A. cadmium plated screws and nuts, supplied. Behind switchboards, on equipment panels, or mounted in Astral Adaptable or other boxes, cubicles, etc., as desired.

**Astral adaptable boxes too**



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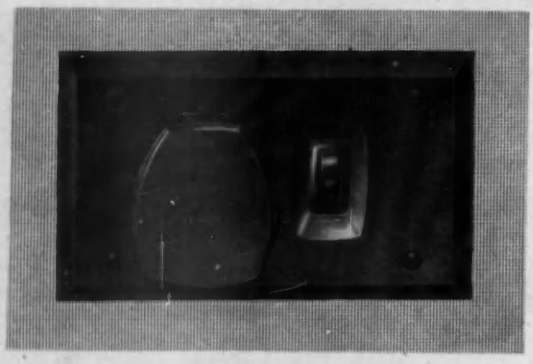

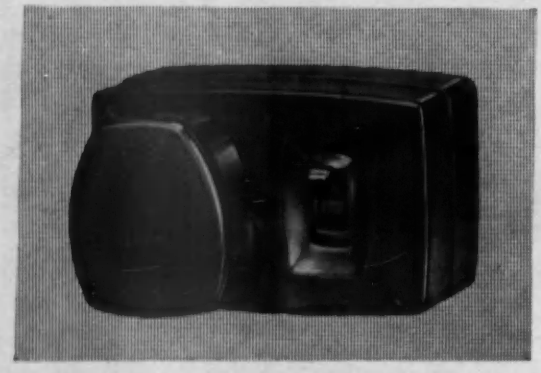

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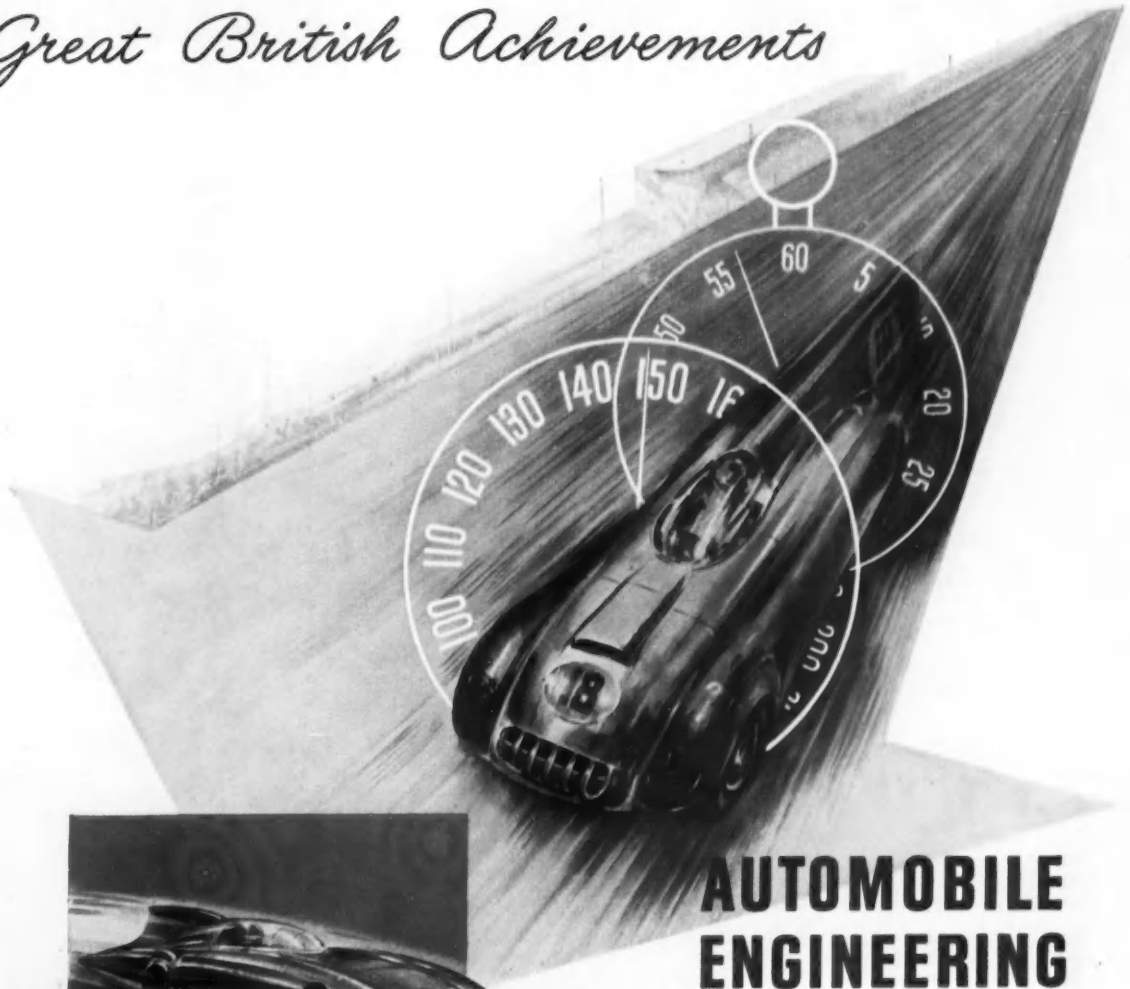


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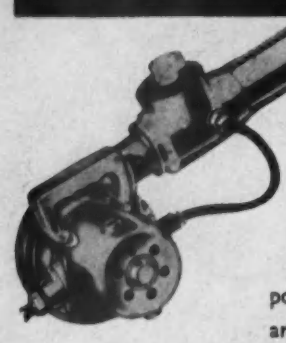

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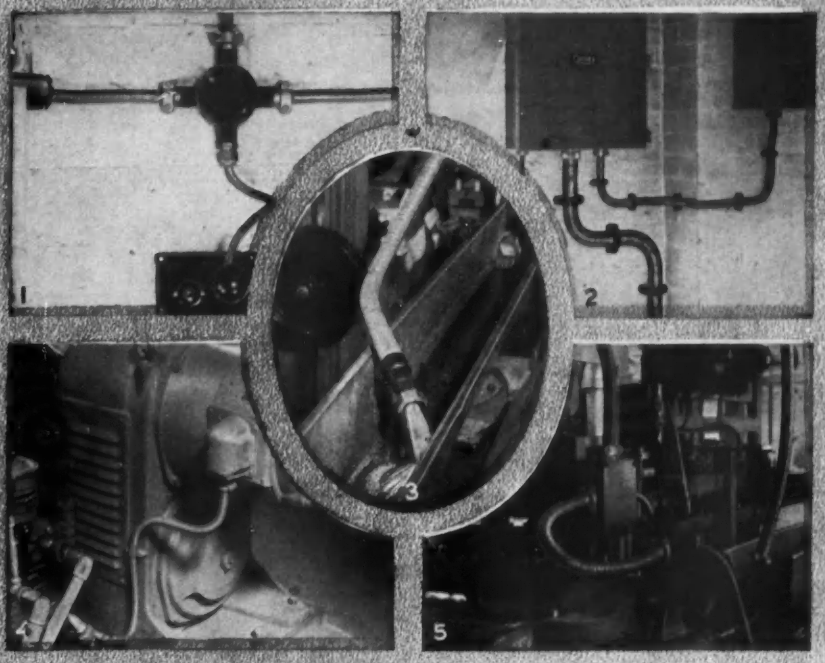


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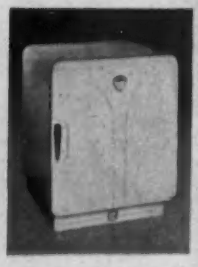

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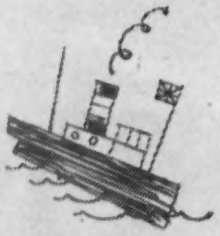

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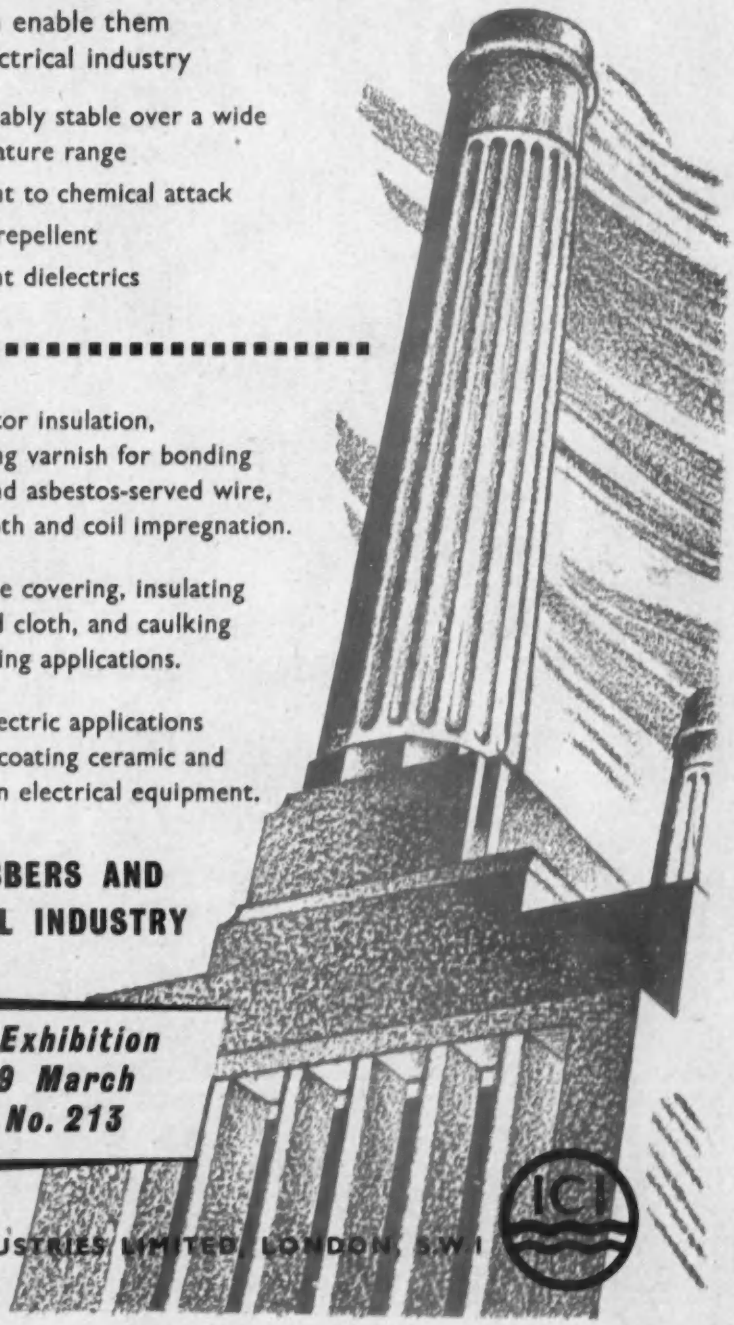

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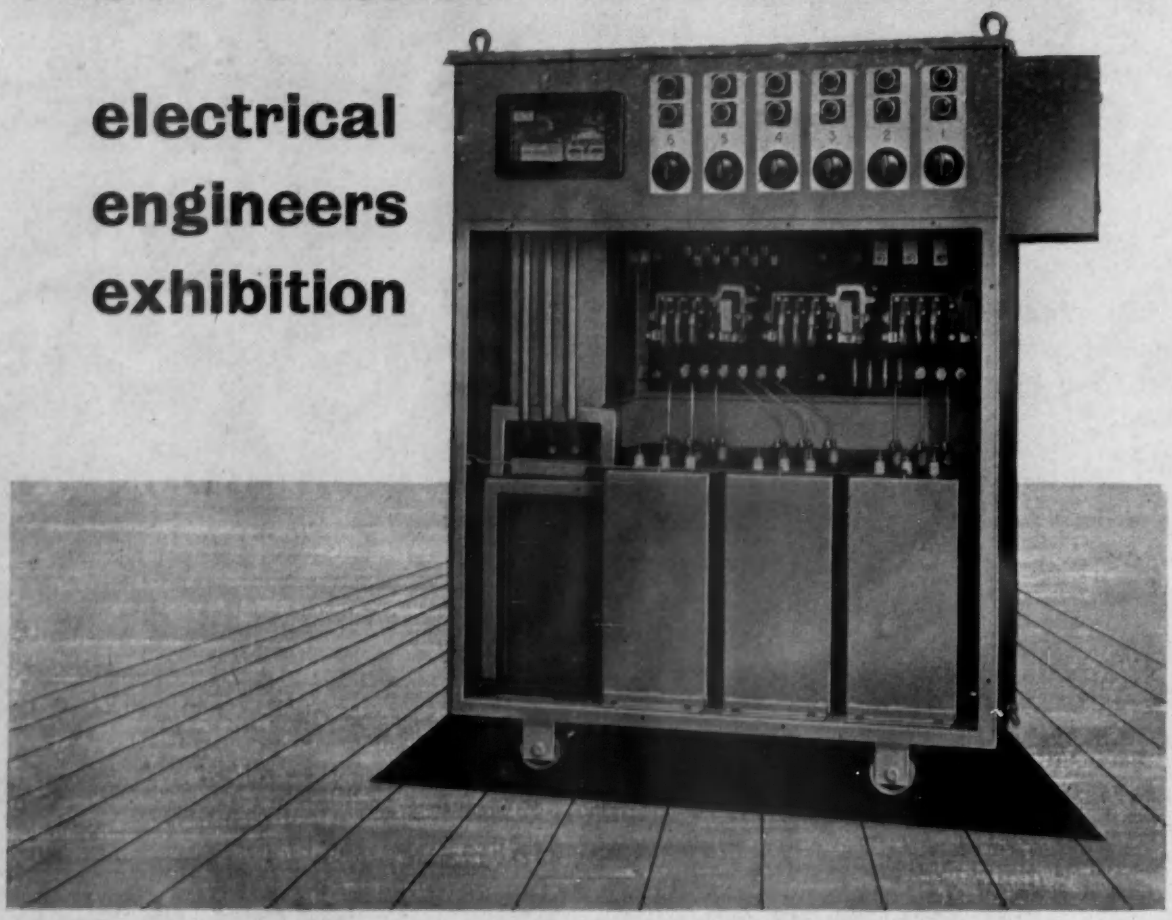

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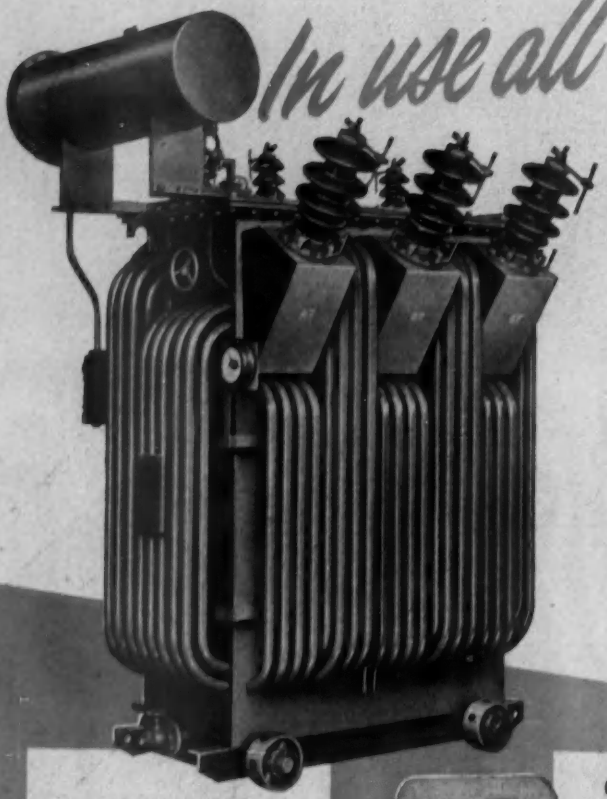

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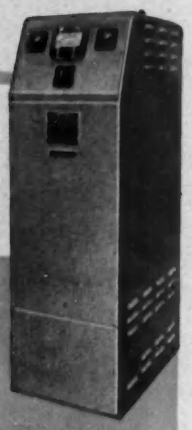

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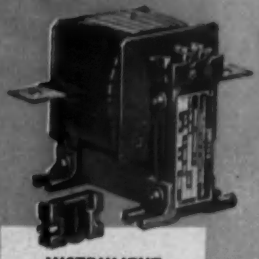

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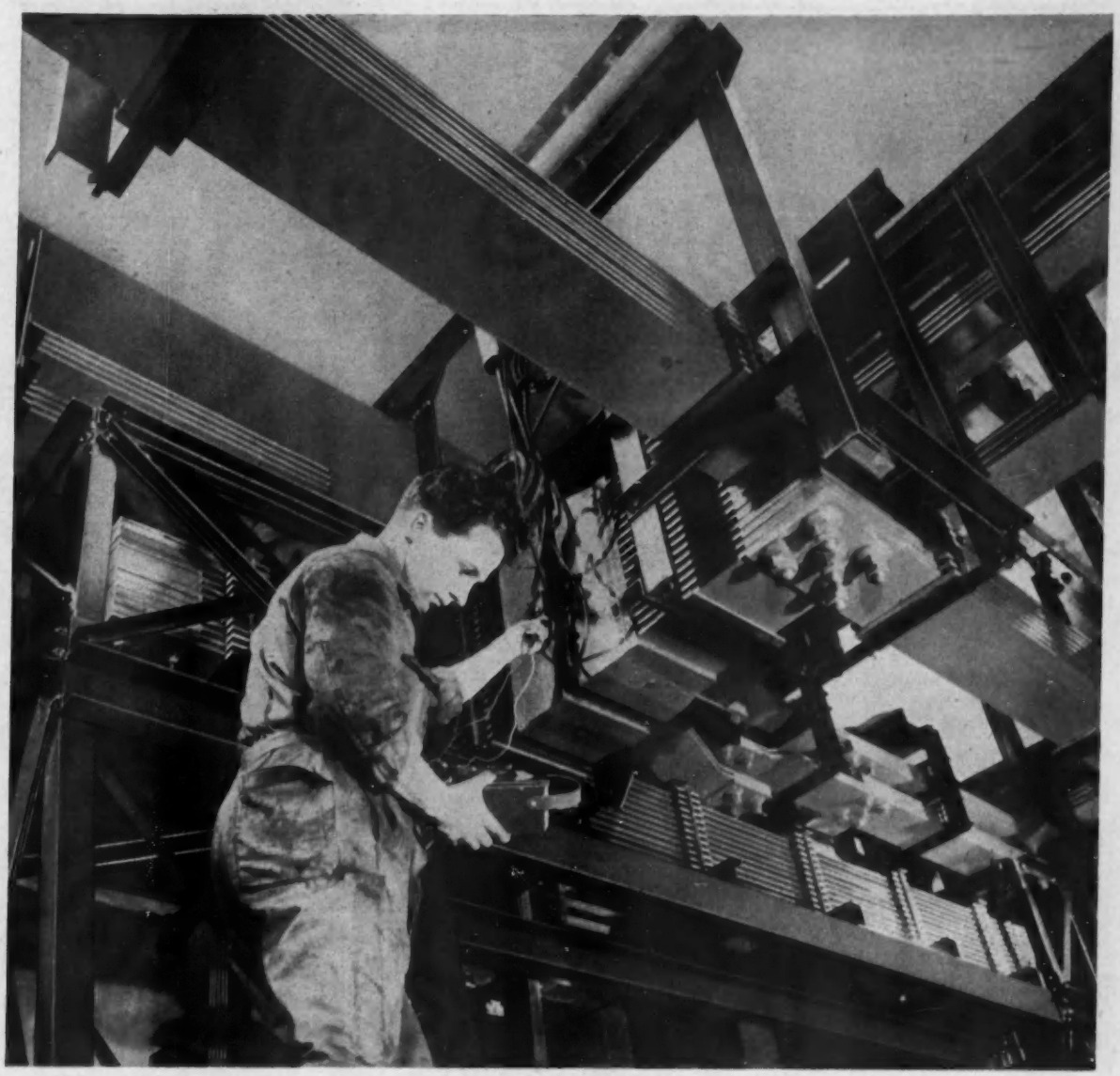
TR/3

*Electrical Engineers Exhibition,* **15th—19th March.** *Mobile Exhibition Stand* **No. 192.**



# COPPER BUSBARS

BICC design, manufacture and install complete busbar systems, including all conductors and supports. Illustrated above is part of the system supplied for the electro-tinning plant at the Ebbw Vale Works of Messrs. Richard Thomas & Baldwins Ltd. The total current carried approaches 50,000 amperes. The resources of BICC and its associated company, British Copper Refiners Ltd., for refining, rolling and extruding copper, are specially suited to the production of heavy current busbars.

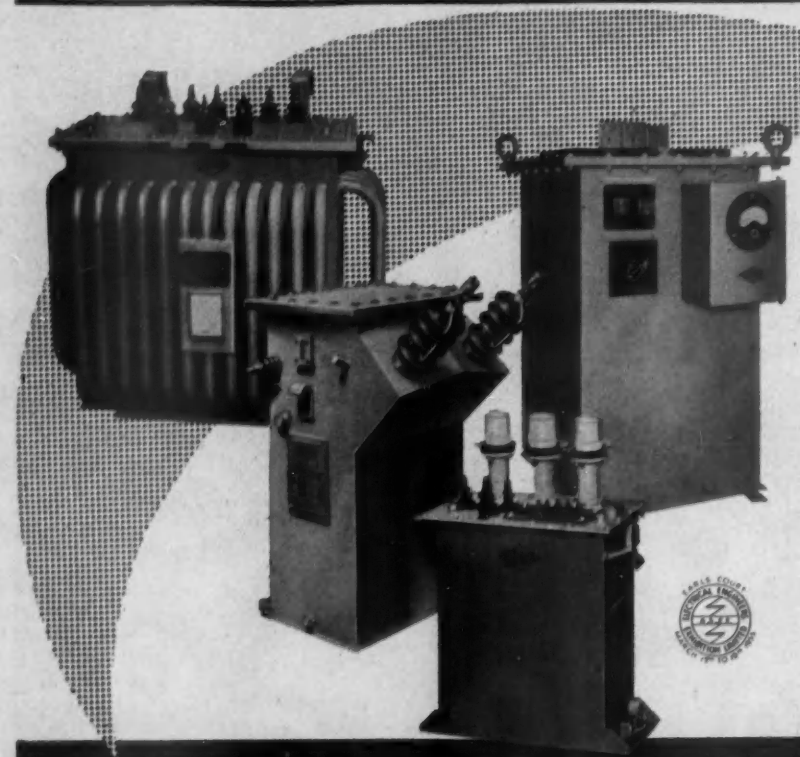
*by*

**BICC**

*Publication 304 tells you more about BICC busbars. Further technical advice is readily available from our specialist engineers.*

BI Callender's

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 BLOOMSBURY STREET, LONDON, W.C.1



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**Transformers to 1,000 kVA**

Every type of Industrial and Power Transformer is manufactured by Woden, including low-loss Rural Transformers for pole mounting and special types for Arc and Resistance Furnaces, transmitting equipment, rectification, electronics, screen heating and phase conversion.

*Production and research is centred on the manufacture of reliable and accurate equipment at the lowest possible cost consistent with first-class materials and workmanship.*

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MOXLEY ROAD
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# BRAY

**Refractory-embedded Metal-Clad**
**ELECTRICAL HEATING ELEMENTS**

**in Strip, Ring, Cartridge & Tubular (TUBALOX) form**

*(See us at* **STAND No. 76** *Earls Court A.S.E.E. Exhibition)*

GEO. BRAY AND CO. LTD. LEICESTER PLACE, LEEDS 2

Tel. Leeds 20981/9

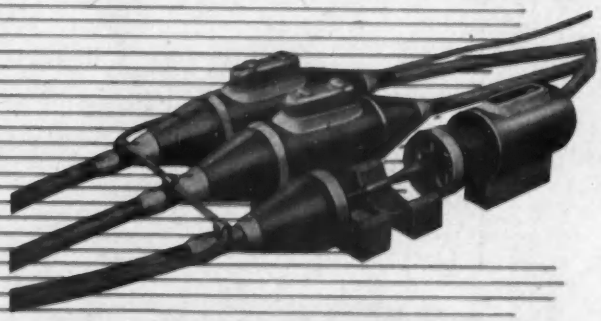
Grams. "Bray Leeds 2"

# GLOVERS *SOLID* TYPE SUPER TENSION CABLE AND JOINTS

*No migration of cable compound under any conditions of laying.*

*Impregnated with compounds which are* ***SOLID*** *up to 65° C.*

*No excessive pressure or vacuum in service*



***SOLID*** *compound insulated, porcelain spaced, joints.*

*No compound migration from joints.*

*Barrier joints unnecessary and never used.*

**W. T. GLOVER & CO. LTD.**

MEMBERS OF THE CMA

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# When you get this sort of enquiry

TH SY TEASHO

Dear Sirs,

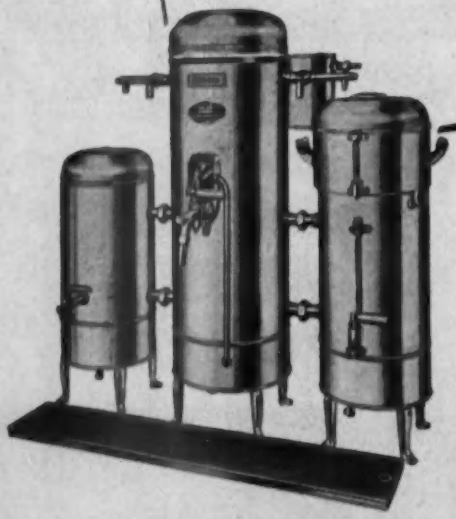
I want a really good boile
tea and coffee making in our
must be simple to operate, rec
easily cleaned.

Above all it must be we
last a very long time.

What do you recommend?

Yours faith

Proprieto



## *You can't do better than* RECOMMEND Jackson Boilers

★ Craftsman-made from finest materials, ensuring long life of trouble-free service.

★ Simply designed with minimum number of working parts.

★ Require little maintenance.

★ Absolutely reliable at all times.

★ Extensive after-sales service available.

★ 'Filtomaton' Drip-filtration system of coffee-making for pure coffee of a consistently fine quality.

*There's a 'Jackson' made for every catering need. 'Jackson' Boilers are supreme for all hotel and restaurant catering, cafes, milk bars, works canteens, hospitals and schools.*

**Jackson Boilers**

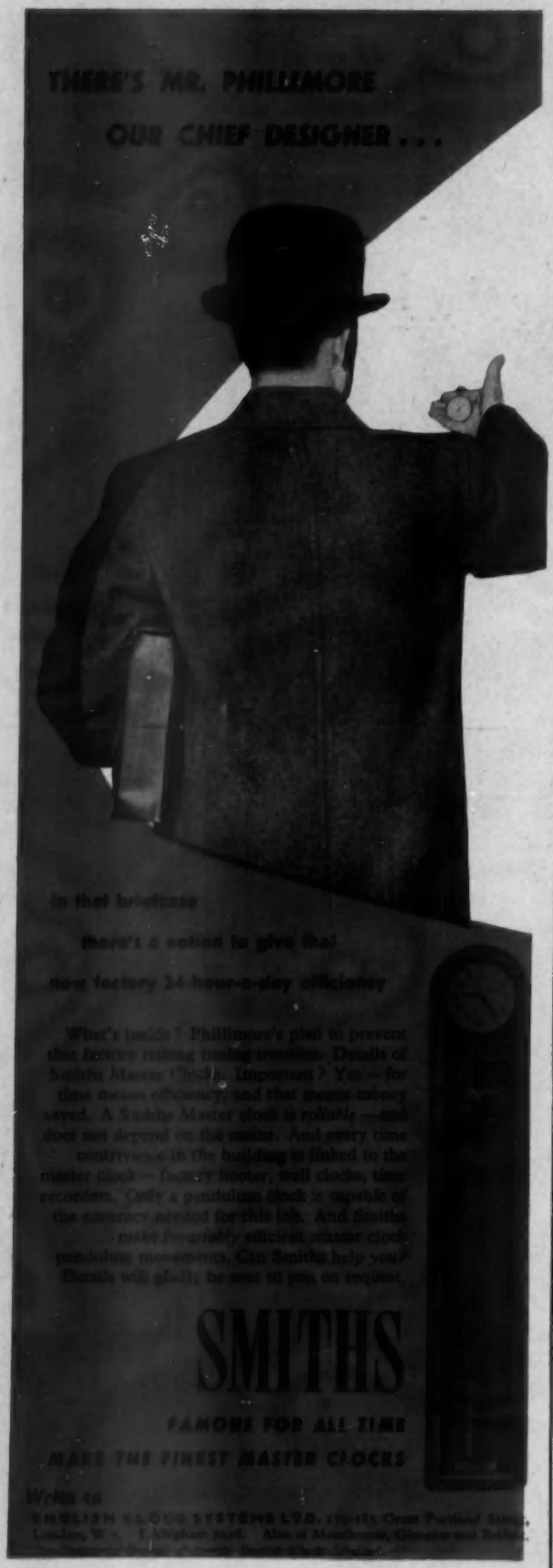
**Jackson Boilers Ltd. Vulcan Works, Shafton Lane, Leeds 11**
**Telephone 3-1088**

***Showrooms:*** **25 Victoria Street (entrance in Abbey Orchard St.), Westminster, S.W.1; 202 Corporation Street, Birmingham; 219 West George Street, Glasgow; 28 Deansgate Arcade, Manchester; 9 King Street, Leeds; 142 Victoria Street, Bristol.**

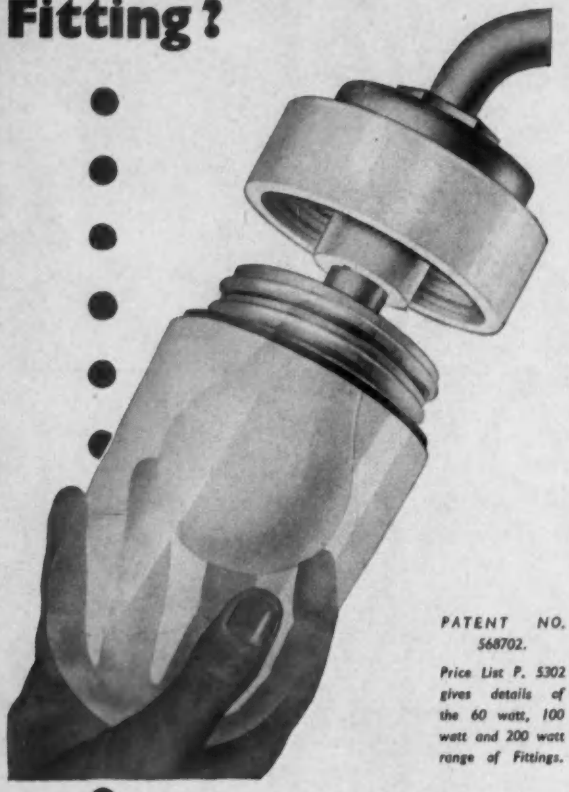
A medium-voltage metalclad distribution switchboard with two oil-break circuit-breakers and outgoing type HH switch-and-fuse circuits as installed for the G.P.O. in Bristol

# Reyrolle

A. REYROLLE & COMPANY LIMITED HEBBURN • COUNTY DURHAM • ENGLAND


THERE'S MR. PHILLIMORE
OUR CHIEF DESIGNER . . .
In that briefcase
there's a notion to give that
new factory 24-hour-a-day efficiency
SMITHS
FAMOUS FOR ALL TIME
MAKE THE FINEST MASTER CLOCKS

# What is the R.E.A.L. cost of re-lamping a Watertight Fitting?



PATENT NO. 568702.

*Price List P. 5302 gives details of the 60 watt, 100 watt and 200 watt range of Fittings.*

Because THERE NEVER CAN BE ANY CORROSION WITH A R.E.A.L. FITTING you can remove and replace the screw-neck well glass in a matter of seconds . . . not so costly . . . is it ?

*Issued by Rowlands Electrical Accessories Ltd., R.E.A.L. Works, BIRMINGHAM 18*

Did you say White Mercury?
SAME SIZE BULB AS 150-200-WATT TUNGSTEN
FLUORESCENT COATING ADDS 4-7% RED
QUARTZ INNER TUBE ENSURES MAXIMUM U.V. EMISSION

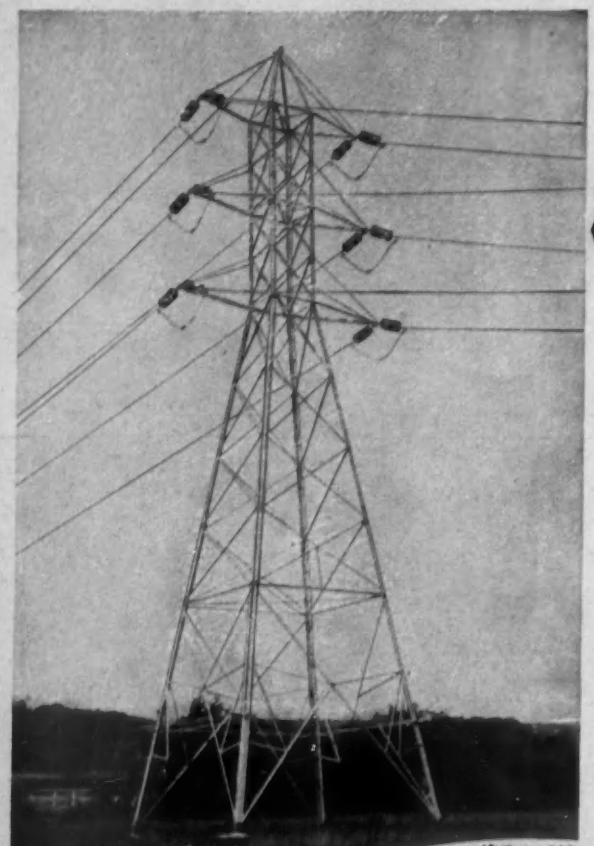
Quite correct. The Metrovick Type MBF lamp is a high efficiency mercury discharge lamp which provides good colour rendering. The secret is a fluorescent coating on the inside of the bulb which adds 6% to 7% red.

80- and 125-watt Type MBF lamps are made in the same size bulb respectively as 150- and 200-watt tungsten lamps. They are ideal for factory lighting and for side street lighting—especially where colour is of importance.

*When daylight fades...*

# METROVICK MBF LAMPS

METROPOLITAN-VICKERS ELECTRICAL COMPANY LTD., St. Paul's Corner, 1-4 St. Paul's Churchyard, London, E.C.4.
*A member of the A.E.I. Group of Companies*



The illustration shows T.T. porcelain Cap and Pin Insulators on one of the first 66 kV Overhead Lines to be erected in the British Isles—a line from Maentwrog to Wrexham which is still in use after more than a quarter of a century.

Taylor Tunnicliff & Co. Ltd. will also supply the Insulators for the latest B.E.A. 275 kV Super Grid Line from Iver via Weybridge to Melksham. (Main Contractors: Balfour Beatty & Co., Ltd., London.)

There's no limit to the **TIME** **PORCELAIN** will **LAST** and the best porcelain is made by Taylor Tunnicliff

USE THE BEST PORCELAIN INSULATORS AND AVOID LIVE LINE TESTING

TT PORCELAIN

TAYLOR TUNNICLIFF & CO. LTD.
Head Office : EASTWOOD, HANLEY, STAFFS.
Telephone : Stoke on Trent 25272-4
London Office : 125 High Holborn, W.C.1
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*During installation Howden Centicell dust collectors at a London Power Station*

# HOWDEN

JAMES HOWDEN & CO., LTD., 195 SCOTLAND STREET, GLASGOW, C.5 and 15 GROSVENOR PLACE, LONDON, S.W.1

# TUBULAR STEEL LIGHTING COLUMNS

*Type Gb 502, 25 ft. M.H. for Group 'A' roads,*

SUITABLE FOR ELECTRIC LIGHTING

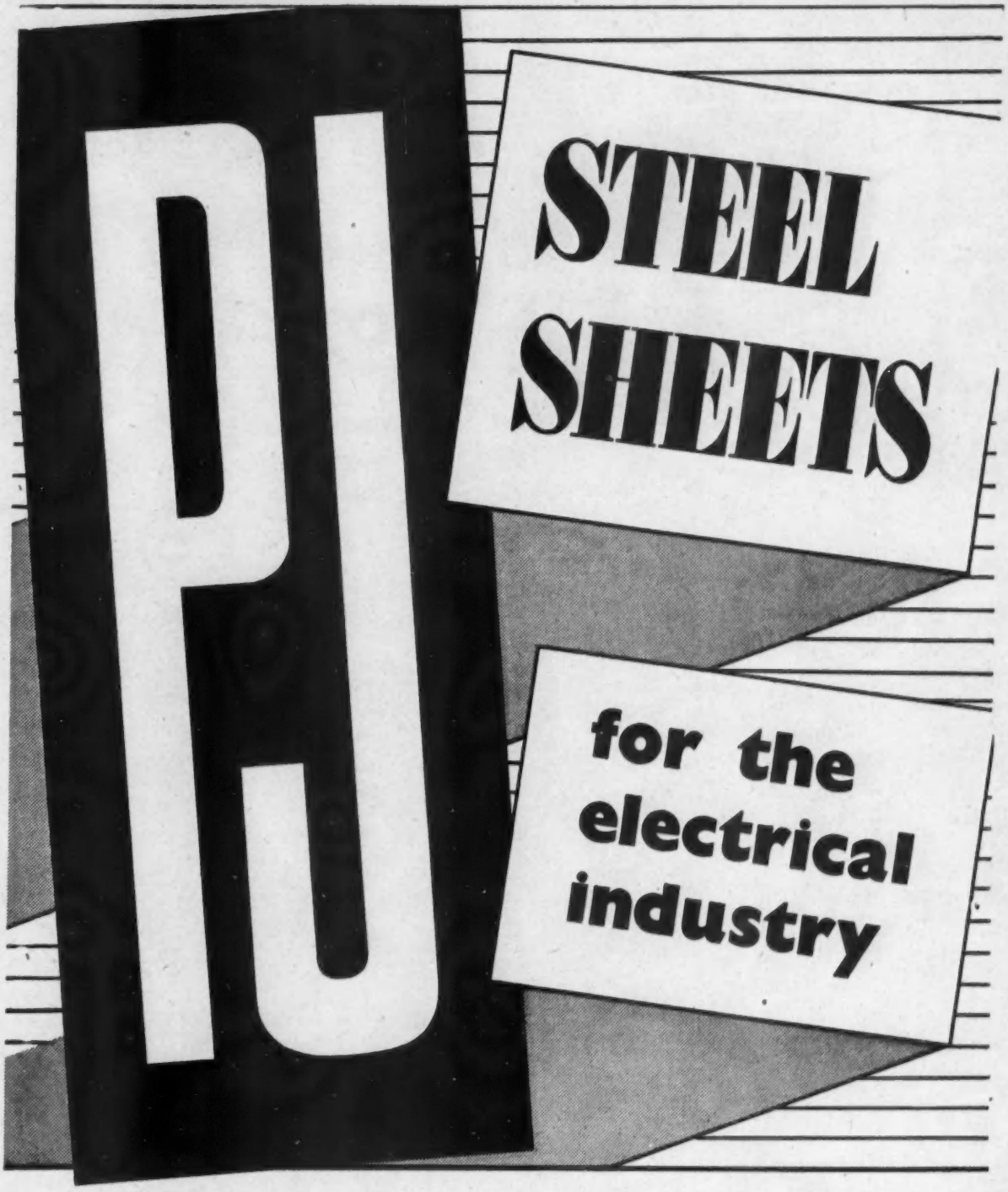
The columns shown have been fitted with G.E.C. bracket arms to suit their '4-80' fluorescent lantern

## STEWARTS AND LLOYDS LIMITED

**GLASGOW · BIRMINGHAM · LONDON**

*The largest manufacturers of steel tubes in Europe*

S&L




**PARTRIDGE JONES & JOHN PATON LTD**

PONTNEWYNYDD NEAR PONTYPOOL

*Telephone:* Pontypool 131/2

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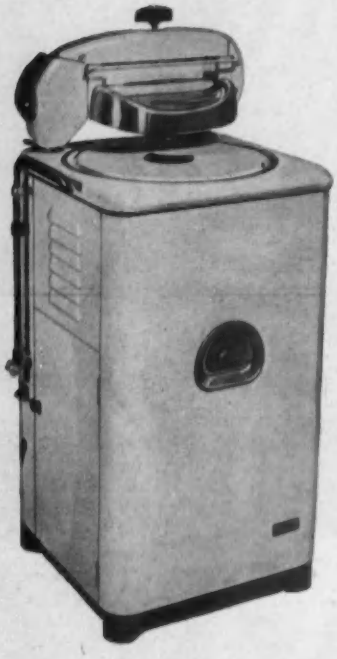
# Mrs. Brown is selling for YOU!

Six star points have quickly won for the Parnall Washer that jackpot of salesmanship—USER RECOMMENDATION.

These star points are worth a moment's study.

**1 APPEARANCE**
No other washer compares in elegance with the Parnall, and women are deeply influenced by design in their choice of domestic appliances.

**2 QUALITY CONSTRUCTION**
Your own specialized knowledge will approve the fine engineering that lies behind the Parnall's superb appearance.



**3 EFFICIENCY**
The unique Parnall agitator provides a scientific water-action that *really* gets clothes cleaner.

**4 EASE OF OPERATION**
Standard sink height obviates stooping. Power washing, wringing and emptying mean less exertion.

**5 RELIABILITY**
In addition to carrying the seal of the Good Housekeeping Institute the Parnall has our own twelve months' guarantee, most generously interpreted: plus nation-wide service organization.

**6 PRICES:**
*Such* value for money at £65.2.0 (or £75.12.0 with own heating element)—no wonder Mrs. Brown is selling for you! Wherever there's a Parnall User, she's busy telling her friends to buy one.

P.S *And don't forget that the Parnall is supported by* consistent *nation-wide advertising, displays, showcards, leaflets and demonstrations at Exhibitions — with enquiries passed to YOU!*

**PARNALL World's Best Safety Washer!**

PARNALL (YATE) LIMITED · 255 NORTH CIRCULAR ROAD · NEASDEN · NW10

WHG/P30

*Switch from*

# DANGER

HIGH VOLTAGE

*to*

# SAFETY

HIGH PROTECTION

## . . . *Automatically*

The Burgess Door Interlock Switch with *Four* Automatic Features!

★ Switch plunger is depressed when the door is closed—the equipment is alive and operative.

★ Switch plunger is released when the door is opened—the equipment is safe and inoperative.

★ Pull out the Switch plunger when the door is open—the equipment is alive and ready for the Service Engineer.

★ Close the door after the Engineer has finished—full protection is restored without touching the Switch.

The Burgess *Automatic* Door Interlock Switch was developed for the *reliable protection* of personnel working with cabinets containing dangerous voltages. When the Switch plunger is pulled out the service engineer can work with full power *on* and the door *open*. Door closed —plunger *automatically* in operation again. Door open once more—power *off*. So even if the engineer forgets to restore the plunger the next man is safe!

Essential for radio, radar, electronic controls, switchgear, and other dangerous voltage equipment.

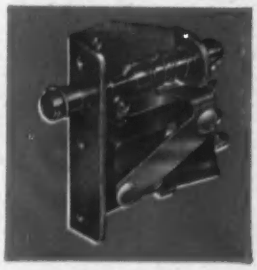
*Send for leaflet MS. 13/D.*

**See this new Switch demonstrated on our Stand No. 214 at the Electrical Engineers Exhibition, 1955, Earls Court, London, March 15–19.**

**BURGESS** *Automatic*

**DOOR INTERLOCK SWITCH**

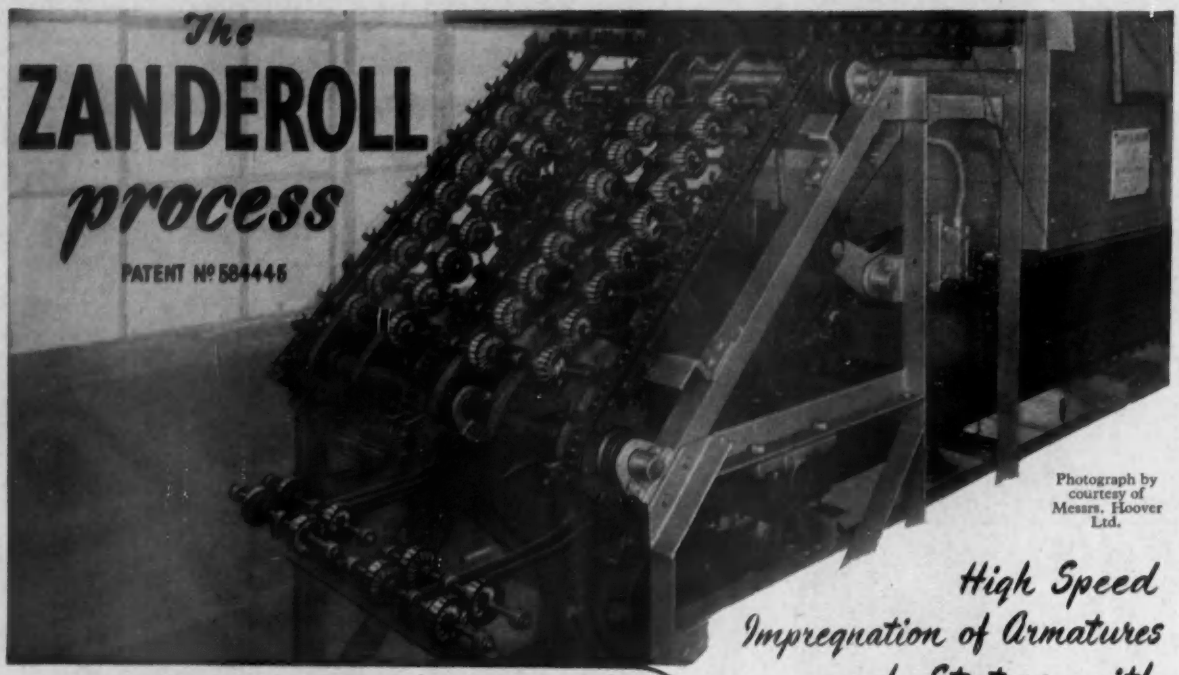
*Industry's Automatic Choice*



**BURGESS PRODUCTS COMPANY LTD.**, Micro Switch Division, Dukes Way, Team Valley, Gateshead, 11
Telegrams: Micro, Gateshead, 11. Telephone: Low Fell 75322 (3 lines)

The ZANDEROLL process

PATENT No 584445



Photograph by courtesy of Messrs. Hoover Ltd.

High Speed Impregnation of Armatures and Stators with Quality and Efficiency

THE STERLING VARNISH CO. LTD.

FRASER RD, TRAFFORD PARK, MANCHESTER 17.

TELEPHONE: TRA. 0282 TELEGRAMS: "DIELECTRIC, MANCHESTER"

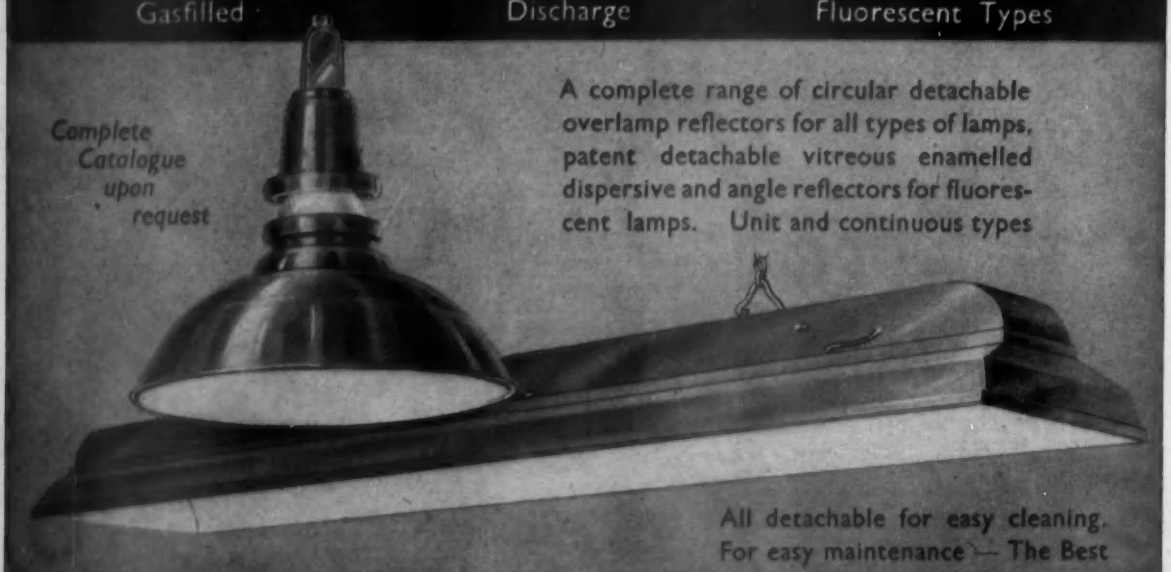
A111

THORLUX REGD. INDUSTRIAL LIGHTING EQUIPMENT

Gasfilled Discharge Fluorescent Types

Complete Catalogue upon request

A complete range of circular detachable overlamp reflectors for all types of lamps, patent detachable vitreous enamelled dispersive and angle reflectors for fluorescent lamps. Unit and continuous types



All detachable for easy cleaning. For easy maintenance — The Best

F. W. THORPE LTD WELBY RD. HALL GREEN BIRMINGHAM 28

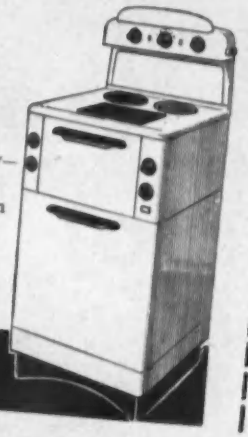
SPRINGFIELD 3318 · 3319 · 3310 MANUFACTURERS GRAMS THORLUX B'HAM

# This TRICITY advertising reaches 18,000,000 readers of the RADIO TIMES

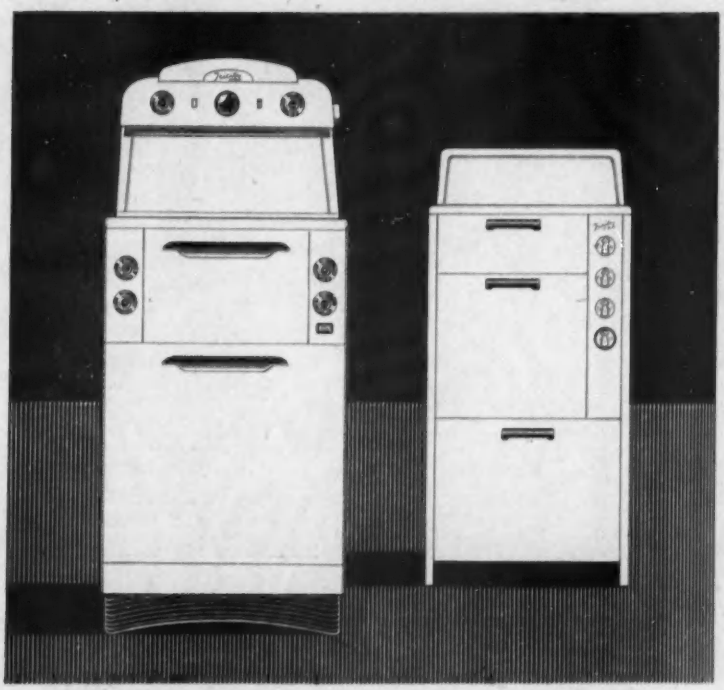
**What's special about the TRICITY QUEEN?...**

*. . . Just everything!*

Some people admire its appearance and simplicity—
Some praise its efficiency and economy—
Most people welcome the large quick heating oven with automatic Time Switch Control.
But all agree that the Tricity Queen is the finest cooker that money can buy.
See this superb cooker, or send for full details to



**TRICITY COOKERS Ltd**
109 Kingsway, London, W.C.2. Tel: HOL 2161



The Tricity 'Queen', recognised as the outstanding cooker of our time.

Model '528', the family model that can even be used from a 13 amp. plug.

**"Shape the product to the need" is the guiding principle behind the design and manufacture of all Tricity cookers. It is therefore natural that there should be a ready sale for every Tricity model on the market. As soon as a particular type of Tricity cooker is available, the word is carried into nearly every home in the country by the "Radio Times".**

***Many of you will already know* that the response to these advertisements may be sudden and somewhat heavy in certain areas. Make sure you are ready . . . order NOW.**

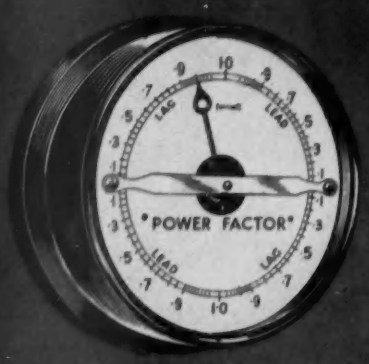
TRICITY

TRICITY COOKERS LTD., 109 KINGSWAY, LONDON, W.C.2. TEL: HOLBORN 2161

# FERRANTI

## *Switchboard Instruments*

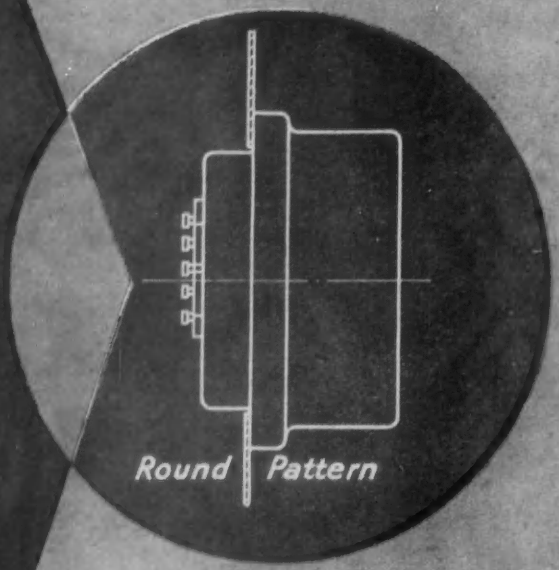
- *New Design*
- *Compact*
- *Good Delivery*




POWER FACTOR METERS

WATTMETERS

FREQUENCY METERS




Here are three instruments from the latest Ferranti range. Shallow pressed steel cases, 4", 6" or 8" round or square dials, semi-projecting or flush mounting. All types of Ferranti switchboard instruments are available in hermetically sealed cases. Full details on request.

**You are cordially invited to visit our STAND No. 87 at the A.S.E.E. Exhibition**

F FERRANTI

**FERRANTI LTD · MOSTON · MANCHESTER 10**
Head Office and Works: HOLLINWOOD, LANCS.
London Office: KERN HOUSE, 36, KINGSWAY, W.C.2

FI 132/2

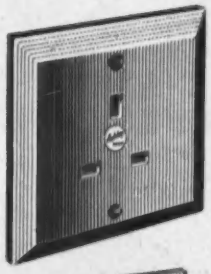
# Ashley REGD. 13 AMP.

## SOCKET-OUTLETS AND FUSED PLUGS

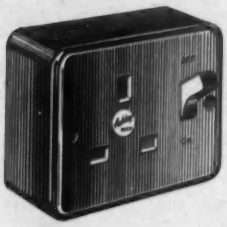
**FEATURES.** To B.S. 1363 where relevant. For ring and other circuits, as shown in "Ashley" Technical Data Sheet No. 1, free on request. Advanced technical design and robust construction with the best materials. Heavy contacts, and clearly marked terminals of ample cable capacity. Non-track socket-outlet base mouldings. Strong insulated covers or plates, with captive screws in matching finish. Surface and flush mounting types, the latter for B.S. 1299, or B.S. 1363 steel socket-outlet tapped lug boxes. Functional styling and excellent finish, brown or cream. Quality controlled. "Ashley" branded, guaranteed and reasonably priced.

***SURFACE***
SK 15 Brown
SK 16 Cream
2 5/16" sq. x 1 1/8" body proj.
Four fixing holes 1 3/16" centres. Four knockouts.

***FLUSH***
SK 13 Brown
SK 14 Cream
3 1/16" sq. x 1/16" plate proj. Base proj. 3/4" x 1 11/16" x 1 3/16". Two fixing holes 2 1/4" centres.



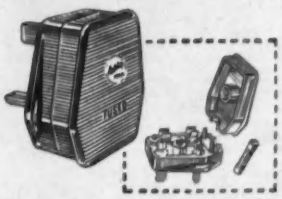
***SOCKET-OUTLETS*** *(above)*. Safety shutters operated initially by plug earth pin acting on brass insert. Self-aligning socket-contacts, integral with terminals taking up to three 7/.029 cables.



***SURFACE***
SS 15 Brown
SS 16 Cream
3 1/4" length x 2 3/16" width x 1 1/8" body proj. Two fixing holes 3" centres. Four knockouts.

***FLUSH***
SS 13 Brown
SS 14 Cream
3 1/16" sq. x 1/16" plate proj. Base proj. 3/4" x 2" sq. Two fixing holes 2 1/4" centres.

***SWITCHSOCKET-OUTLETS*** *(above)*. Description as of socket-outlets, with addition of A.C. single-pole slow-break switch movements, complying with B.S. 816. Heavy copper-inlaid-silver switch contacts. Smooth and positive action, controllably silent. "Ashley" Patent.



***FUSED PLUGS*** Fingergrip. Easily wired clamp terminals taking up to 70/.0076 conductors cut as one length. Visible earth connection. Adjustable saddle cable grip. Readily renewed B.S. 1362 cartridge fuse-link in silver-plated clips, 13 amp. rating supplied unless 3 amp. or 7 amp. specified. Large captive cover-screw. Neat and durable.

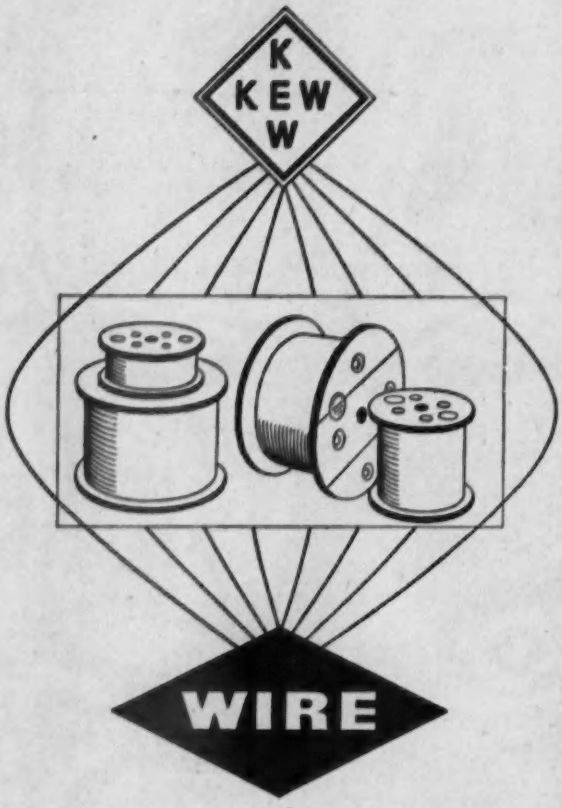
*For an "Ashley" Fused Plug to be supplied with each socket-outlet, add "P" to Cat. No. letters, i.e., as SKP 15, etc.*

We are exhibiting at the 1955 Electrical Engineers (A.S.E.E.) Exhibition, Earls Court, March 15th to 19th.

## CONNECT WITH

Ashley REGD. Guaranteed ELECTRICAL ACCESSORIES

ASHLEY ACCESSORIES LTD
ULVERSTON, LANCASHIRE
Phone: Ulverston 3333 Grams: Ashley, Ulverston
MEMBER OF THE "ASHLEY" GROUP

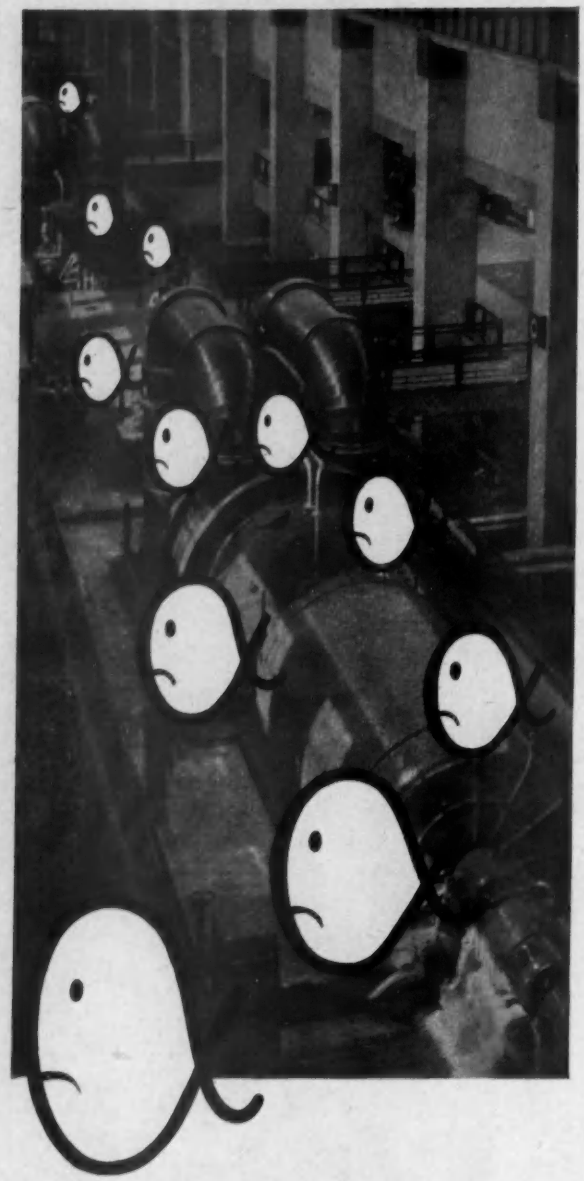



*...in a wide range of covering*

The opening of our new factory at Bracknell brings a welcome easing of covered wire supplies to all our customers in the electrical industry. Now you may confidently order the covered wire you need from our range of paper, cotton, silk, rayon, etc.

**KENT BROS. ELECTRIC WIRE CO.**
**& E. H. PHILLIPS LIMITED**
***KEW WORKS · BRACKNELL · BERKS***
*phone: Bracknell 881 (4 lines)*
*Grams: Encoil, Bracknell, Berks*

Smee's



**IF THERE ARE AMPS IN YOUR POWERHOUSE**

"ASHLAM" insulation board keeps them where they belong —there's a grade for every job

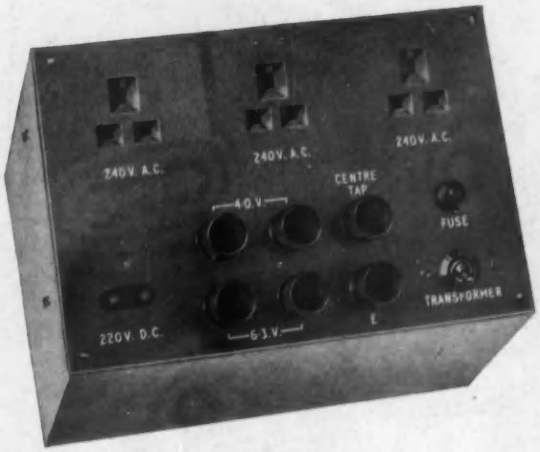
**ask Ashdowns**

ECCLESTON WORKS, ST. HELENS, LANCS. Telephone: St. Helens 3206
Ashdowns Limited is a subsidiary of Pilkington Brothers Limited
*"ASHLAM" is the registered trade mark of ASHDOWNS LIMITED*

# Tucker

## SPECIALITIES

## ON STAND 99
## A.S.E.E. EXHIBITION
## EARLS COURT




Tucker Specialities comprise Special assemblies of components such as Switches, Push Button Starters, Socket Outlets, Pilot Lampholders for Remote indication, Simmerstats, etc., produced to meet Consulting Engineer and Architect Specifications.

### ENQUIRIES ARE INVITED

A complete range of Standard Tucker Accessories is also displayed, prominence being given to the increased development of Industrial and Domestic Switches and Switched Socket Outlets in Iron Boxes.

**DO NOT FAIL TO VISIT US ON STAND 99**

Tucker TELAC

**J. H. TUCKER & CO. LTD., Kings Road, Tyseley, Birmingham, 11**

*Makers of First Grade Electrical Accessories since* 1892

**LONDON OFFICE : 2 Newman Street, W.1**

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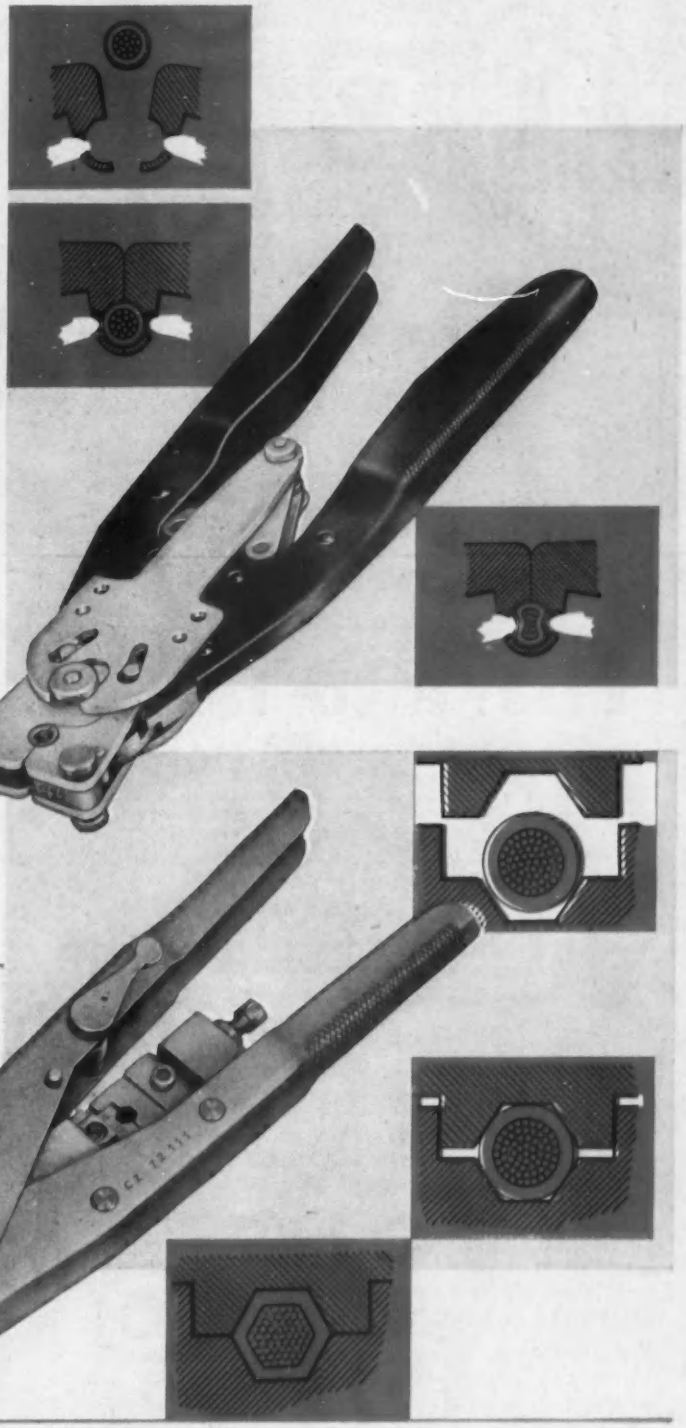

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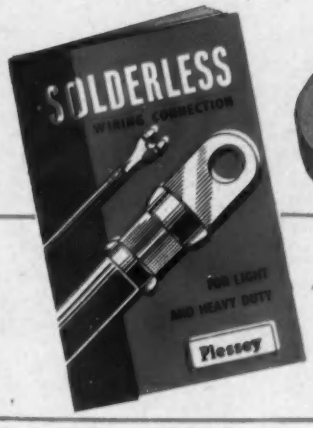


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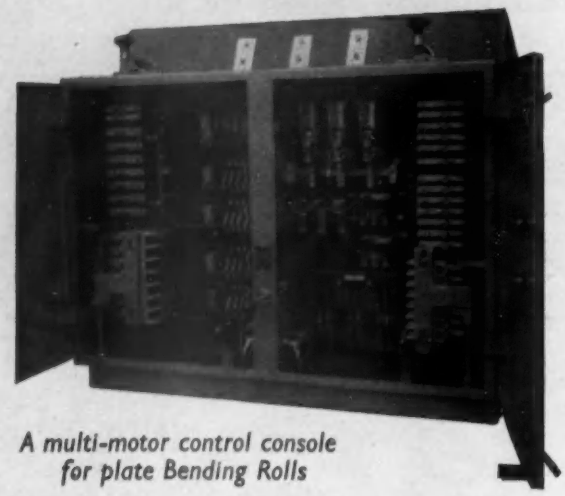

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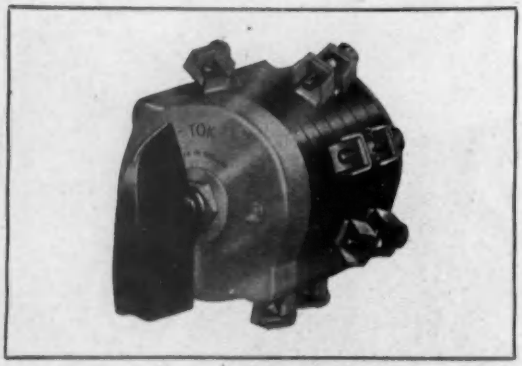

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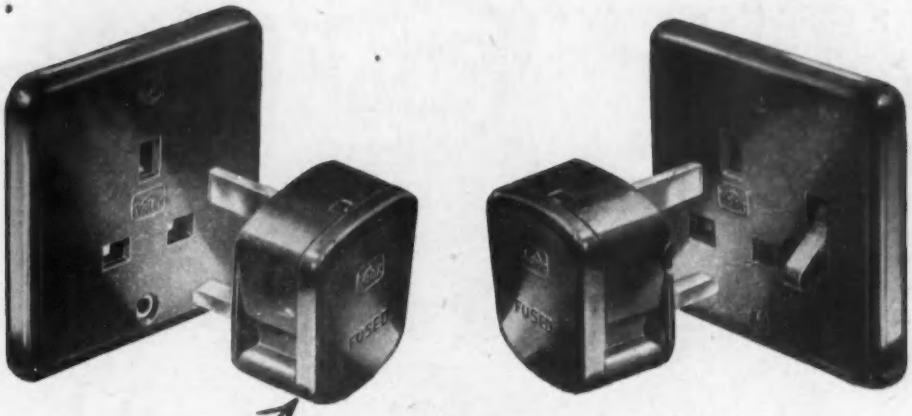

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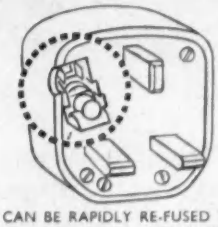

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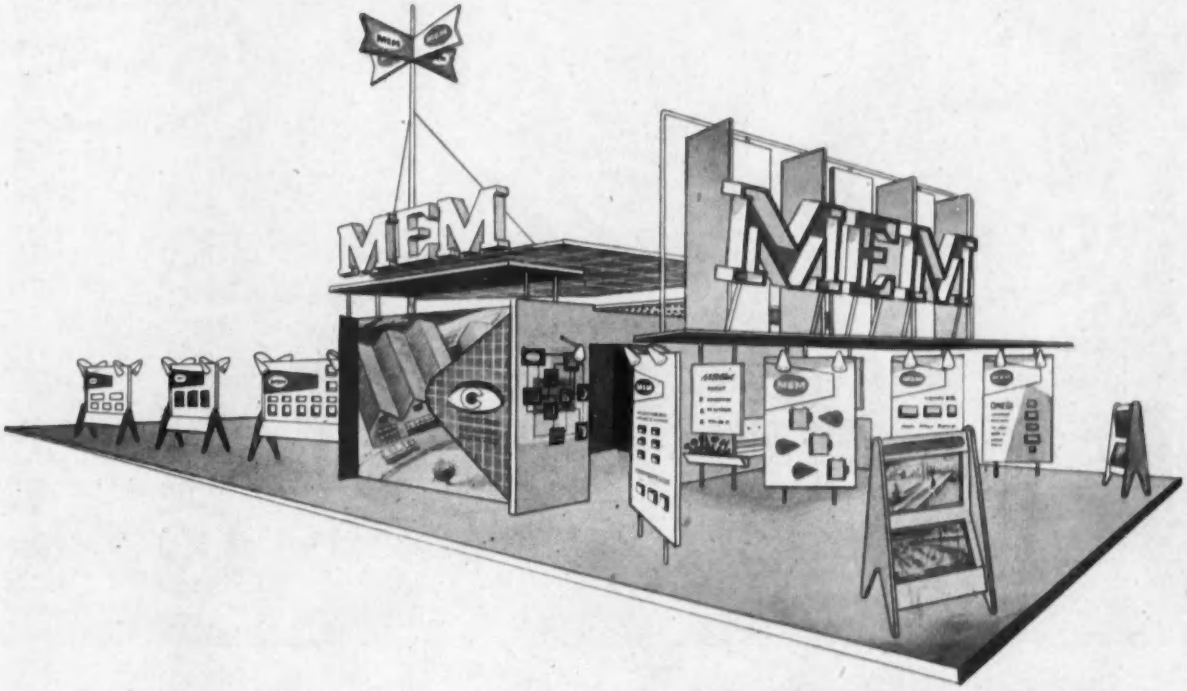


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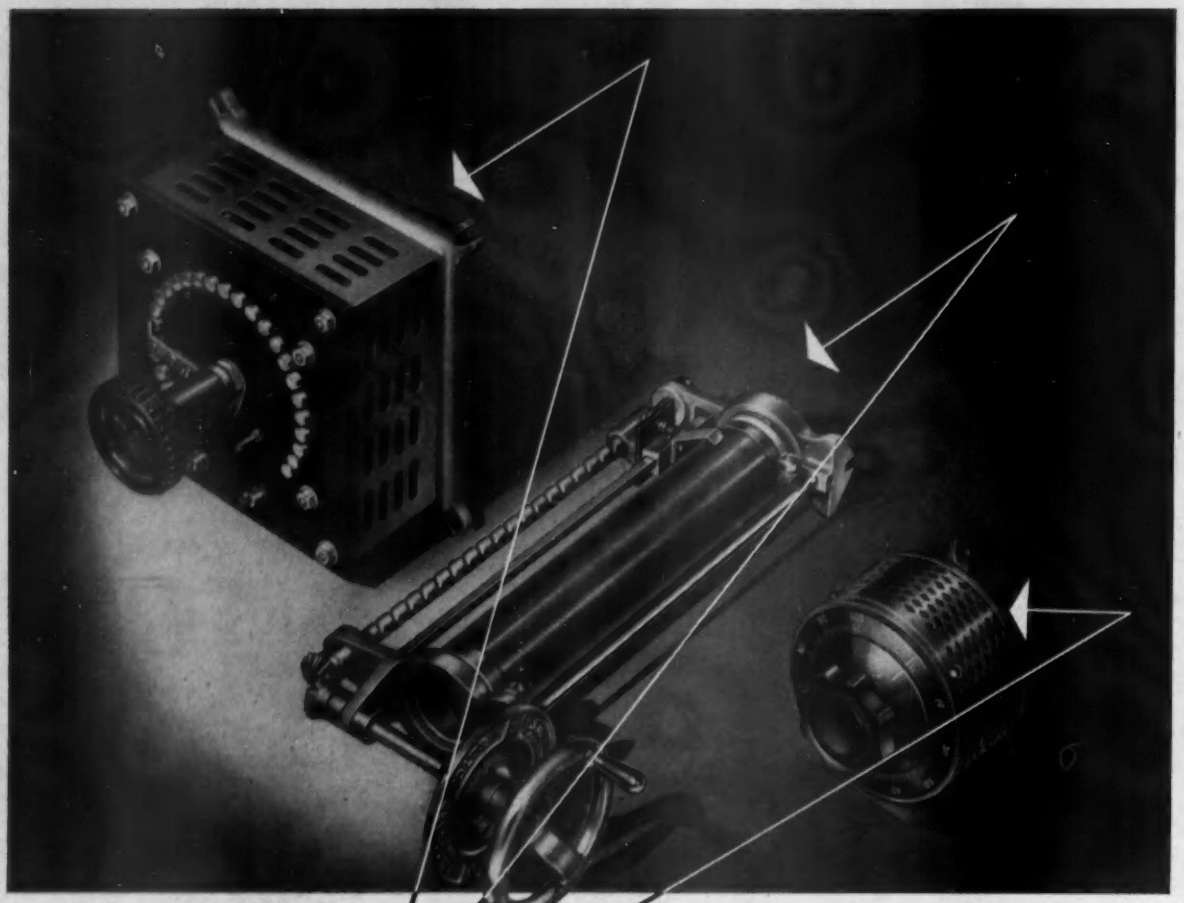

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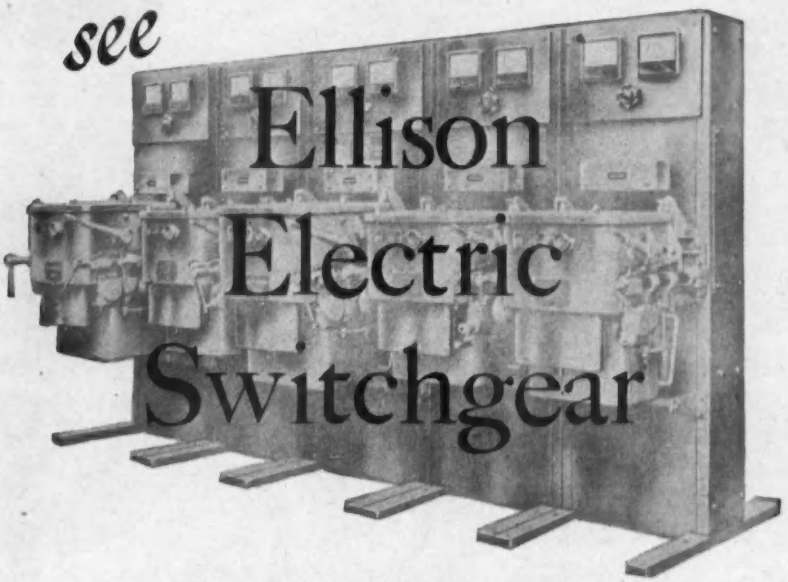


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# ELECTRICAL TIMES

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### KARIBA FIRST

After many years of discussion, a decision has at last been reached on the construction of a major hydro-electric scheme in Rhodesia. The choice has fallen on the Kariba Gorge project, the larger of the alternatives, thus reversing the strong preference for Kafue that seemed apparent a short while ago. The length and heat of the public debate preceding this decision has been evidence not only of political considerations arising from the geographical position of the schemes in Southern and Northern Rhodesia respectively: it has shown as well that when all the complex problems involved are considered, there is little to choose between the two schemes. It is, however, in some ways disturbing that the final choice should have been made largely on the advice of a French engineering mission which had only a few weeks to study the ground, before pronouncing on the quality and correctness of plans based on much longer and closer studies. Concern on this point has already led to one important resignation in the power hierarchy of the Federation. Yet to the remote observer, it seems more important that some choice should be made, rather than that there should be assurance that marginal advantages are correctly evaluated. The project now moves into the stage of finance-raising, with the World Bank as the likely source of the necessary loans. Too often in the past that has meant American consultants and American equipment, though there is nothing in the constitution of the Bank to require this. The projected Zambesi scheme, like that controlling that other great African river, the Nile, at Owen Falls, must surely be British engineered and equipped.

### CLEARING THE ETHER

Well over one-half of all the traced sources of radio and television interference are found to be electric motors, particularly small commutator motors as used in many domestic appliances. Consequently, the two new sets of regulations, now laid before the House of Commons, which give permissible levels of interference for motors and refrigerators, can come as no surprise to the electrical industry. These regulations follow closely on the pattern of the previous regulations dealing with the control of interference from ignition systems. The size of motor concerned is defined as "less than 1 horse power per 1,000 revolutions per minute," which thus includes practically every domestic appliance, and the regulations apply to both new and existing machines. The refrigerator regulations, in addition, require manufacturers, sellers and hirers to ensure that suppressors are fitted prior to use or

sale of refrigerators in the United Kingdom. Both sets of regulations (due to come into operation on 1st September this year) will be enforced by the Postmaster-General but action will not be taken except where specific complaints are received of interference. The G.P.O. will, however, as before, remain responsible for investigating such complaints and tracing the offending item, but the fitting and supply of the necessary suppressors will be carried out by local electrical and radio contractors. This may not be an easy task in the case of existing smaller appliances where space is not available within the carcase to accommodate the necessary condensers, although the propagation of interference into the mains may be prevented by in-line or plug-top suppressors. The long-term solution is undoubtedly the inclusion of suppressors in all appliances by the manufacturer and, indeed, the extension of the motor regulations to include the manufacturer is to be reviewed in the next two years with this end in view.

## SIZE AND QUALITY

Those who shivered at the Horticultural Hall on the occasion of the first Electrical Engineers' Exhibition four years ago will recall the enthusiasm that swept that small beginning to success. The Fourth Exhibition which opens next week is altogether more resplendent: its organisers point out with justifiable pride that with stands occupying over a quarter of a million square feet at a national showplace, it is the largest exhibition of its kind ever to be held in Britain. To what extent will it retain in its inevitably less intimate atmosphere that enthusiasm which marked its beginning and, in hardly modified degree, its two subsequent appearances at Earls Court? It will succeed as well again if the staff on the stands again show their willingness to discuss technical details and operating problems with all visitors, according to their particular interests, knowing that in this "closed" exhibition, enquirers are certain to be concerned in some way in the electrical industry. This approach has been the strength of the Electrical Engineers' Exhibition up to the present: whether it has serious disadvantages for the future was discussed in these pages last week. To make electricians and apprentices as readily welcome as senior engineers and overseas buyers is essentially a home sales approach, but the need for export promotion is looming still larger, in the policy of the electrical industry. The exhibition management has this year claimed to have kept in mind this need to provide an export window. Their degree of success in this endeavour must have a strong bearing on the exhibition's future. It will certainly be a leading criterion when evaluating next week's events.

## TOO MANY TESTS

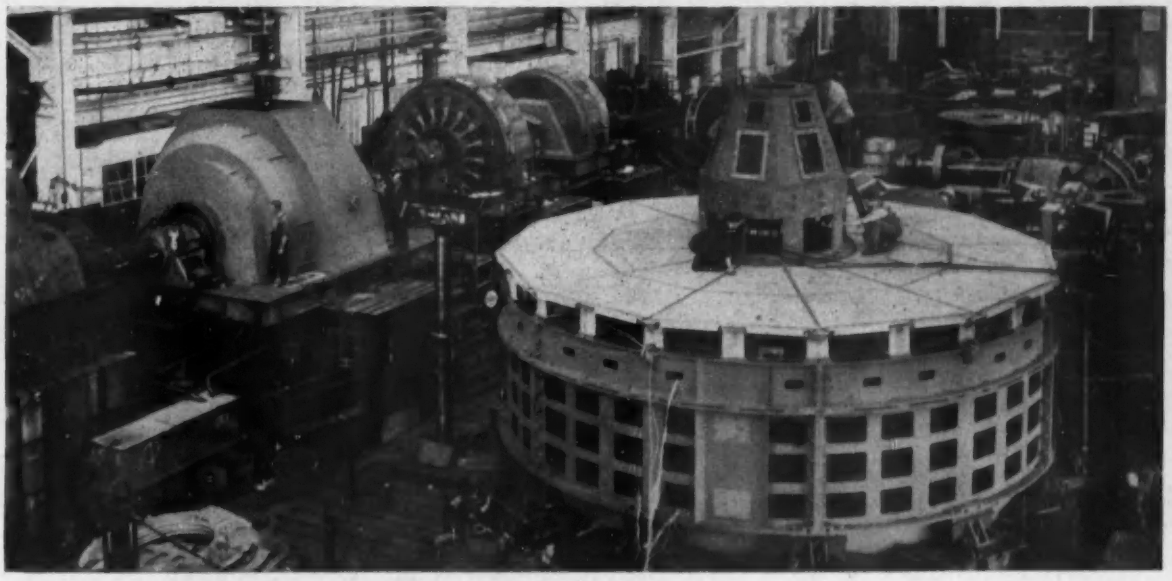
Manufacturers of electrical machines would test products even if their customers made no demand in that respect. Some check on quality would be sought as a means to ensure maintenance of their reputation, and occasionally comprehensive tests would be called for to prove the calculations of designers. The position today, however, seems to be that testing is at the far extreme from this irreducible minimum. Such a situation has arisen from the continued demand of consulting engineers for detailed results of comprehensive tests on machines whose construction they are supervising for their clients. Just how necessary are individual results of this nature for machines of effectively proved design is a question on which designers and customers will seldom agree. Tests are undeniably expensive and there is sometimes a suspicion in the manufacturer's mind that those who specify them do not clearly appreciate all the work that they entail, and perhaps fail as well to realise clearly how the precise results obtained are conditioned by the method of testing adopted. Large synchronous machines are an extreme case, but the problems involved in testing them can serve as an example of the too seldom realised complications that arise in testing all large electrical machines. It is for that reason, as well as for its intrinsic interest, that we recommend to those concerned in preparing technical specifications the article on testing which begins in this week's issue.

## PRODUCTIVITY DOUBTS

British industry has so often been compared unfavourably with American when productivity has been under discussion, that the remarks of Colonel B. H. Leeson in a recent I.E.E. discussion are worthy of wide attention. He doubted if there was much wrong with productivity in this country, claiming that in electrical work, at any rate, there was little to choose: but more important, he suggested that increased productivity was not the only solution to our problems. What was required was more efficiency and, in plain language, harder and longer work. Such outspokenness from a leader of the industry which has the closest concern with the physical means of increasing productivity deserves serious consideration by those who readily criticise our methods.

## LIGHT ON LEARNING

Tomorrow, with all due ceremony, electricity will be switched on in the last of the London county schools hitherto served with gas lighting. This event will mark the culmination of a major programme of conversion which originated well before the last war. The size of the programme, however, may be judged by the connection of no less than 15 MW of potential load within the post-war programme which took in only one-third of the total. Not only in the lighting field but also in educational facilities is electricity proving its worth. Power points have been installed to provide supplies for machines used in the handicrafts and housecraft classes, and low voltage supplies are available for use in the science laboratories. It is thus possible to use to the full modern teaching techniques and equipment such as film projection, epidiascopes and other visual aids. At the same time in the housecraft and handicrafts sections the children are introduced at an early age to the virtues and convenience of electricity in the manufacturing and domestic fields. A further important advantage of electricity is that in those schools catering for the partially deaf, amplifiers, microphones and earphones can be used with great advantage both to teacher and pupil. The completion of this conversion plan, which during the last eight years has cost some £800,000, marks, therefore, a most important step in the development of London's educational system.



PART ONE
—METHODS OF TEST

# Factory Testing of Large Synchronous Machines

By P. G. ROSS B.Sc., A.M.I.E.E.*

FULL-LOAD, rated power factor tests of large synchronous machines are clearly impracticable in the factory, except for the smallest units, and the evaluation of machine performance from the results of equivalent tests involves assumptions and simplifications. The nature of, or need for, these is sometimes not clearly understood.

The purpose of the present article is to discuss briefly a few aspects of such factory testing, and it is hoped that it will help to fill gaps in the interested reader's knowledge of this subject. Large synchronous machines are considered, in particular waterwheel alternators, but most of the remarks also apply to small and medium-sized units.

The main purposes of testing a synchronous machine in the manufacturer's works, under conditions simulating as closely as possible those which will occur when the set is finally installed, is to demonstrate to the purchaser, or his representatives, compliance with the specification and satisfactory operation.

The selling price of a large waterwheel generator may amount to many thousand pounds sterling and failure to comply with the specification, especially with regard to maximum temperature rise and losses, may involve a commensurate penalty and even the right of rejection. Site tests can rarely be carried out under controlled conditions, are not always accurate or convenient, and are costly. The designer may thus have to rely on factory tests to demonstrate compliance with the specification. Their accuracy and thoroughness must be of a sufficiently high order to maintain the reputation which the manufacturer has built.

* Design Engineer, Plant Engineering Dept., B.T.H. Co. Ltd., Rugby.

*Fig. 1. The heading illustration shows a 35·3 MVA, 375 r.p.m. 11 kV horizontal waterwheel alternator with driving motor (left) and 44·4 MVA, 136 r.p.m. 11 kV vertical waterwheel alternator (foreground) erected for test in the factory*

The time involved in erecting for test and dismantling a large unit (Fig. 1) may amount to many weeks and valuable floor space is taken up in the factory. In the majority of cases a manufacturer will receive an order for several identical machines and a useful compromise is to erect and test the first machine only. The remaining units would be despatched to the site without having been erected or tested, except for partial erection of the main components to check assembly and for partial tests of a dielectric and magnetic nature. However, in the case of very large machines the erection and testing of even one unit in the factory may be impracticable.

## Simplified Vector Diagram

Consider the well-known simplified vector diagram of the synchronous machine (Fig. 2). It is seen that there is no basic difference between a motor and a generator. A generator at lagging power factors resembles closely a motor at leading power factors, and a generator at leading power factors a motor at lagging power factors. In fact, if the stator winding resistance drop—usually small—is neglected, the one vector diagram is the mirror image of the other about the current vector axis.

The term "equivalent loading", which is often used in connection with testing, signifies that the actual operating conditions of the machine, as regards losses, temperature rises, etc., are simulated by one or more tests in which there is no active-power flow, with the exception of that due to the losses.

The following principles are important:

(*a*) Synchronous generator operating singly on an isolated system:

(i) the power factor at which the machine operates depends entirely on the power factor of the load.

(ii) the voltage is determined entirely by the excitation and the characteristics of the load.
(iii) the output of, and the losses in, the machine are determined by the characteristics of the load and by the voltage.
(iv) the mechanical power input exactly balances the output and losses of the generator, thus keeping the speed correct.

(*b*) Synchronous machine operating in parallel with a system:

(i) operation as a generator, or motor, depends on whether mechanical power is supplied to, or taken from, the shaft of the machine.
(ii) the change from generating to motoring is smooth.
(iii) with the machine operating light, i.e. on no load, the losses in it can be supplied mechanically from the prime mover (generator) or electrically from the system (motor).
(iv) the power factor at which the machine operates is determined entirely by the excitation.
(v) the active power and in-phase component of current are determined by the mechanical power supplied to, or taken from, the machine.
(vi) the reactive power and out-of-phase component of current are determined by the excitation.
(vii) the voltage and speed are determined by the voltage and frequency of the system.

## *Determination of Losses and Efficiency*

The efficiency of a synchronous machine is normally regarded as an important quantity. However, efficiency is rather indirect and losses are a much better criterion of performance. Not only, as explained below, is it normally easier to evaluate losses than efficiency, but efficiency is also markedly dependent on power factor whereas losses are little dependent on power factor. Efficiency actually becomes meaningless in the case of a synchronous condenser.

The following methods of determining losses, and thus efficiencies, are available.

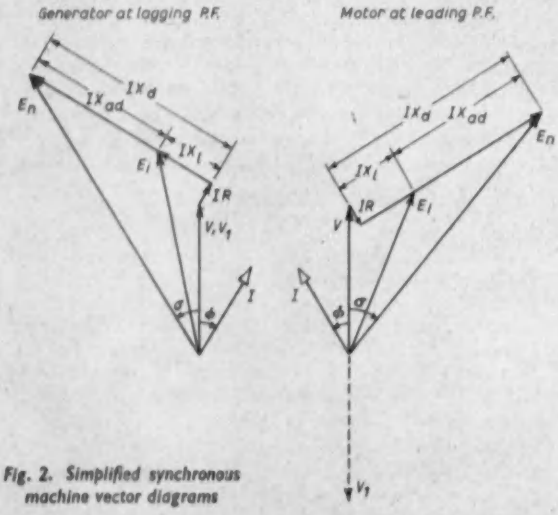



*Fig. 2. Simplified synchronous machine vector diagrams*

$V$ = terminal voltage
$V_t$ = generated voltage
$I$ = line current.
$\phi$ = power factor angle
$\sigma$ = load angle
$R$ = stator winding resistance
$X_l$ = stator winding leakage reactance
$X_{ad}$ = armature reaction reactance
$X_d$ = synchronous reactance
$E_l$ = internal voltage (i.e., behind stator leakage reactance)
$E_n$ = voltage behind synchronous reactance

OUTPUT-INPUT METHOD.—It would appear that the easiest method of determining the losses in a synchronous machine is by operating it on full load and at rated power factor and taking readings of input and output power. This method is however unsatisfactory, except for the smallest machines. It is quite impracticable to load a large synchronous machine with full kW load in the manufacturer's works. Moreover, the accuracy obtainable is rather low on account of the difficulty of measuring the quantities involved to the necessary degree of accuracy.

SEPARATION OF LOSSES.—The method of separation of losses, recognised internationally, is based on the principle of superposition and consists in assuming that the various losses can be separated and measured individually by a series of tests. In particular, the assumption is made that the losses on the stator of a synchronous machine on full load and at rated voltage and power factor, a combination of electric circuit and magnetic circuit losses assumed independent of each other, are the same as the sum of the losses obtained on the stator during two tests at the extreme values of load impedance. A test at rated speed and at rated voltage on open circuit, when the load impedance is infinitely high and no current flows, can be used to yield the magnetic circuit losses. Similarly, a test at rated speed and at rated current on short circuit, when the load impedance is infinitely small and no terminal voltage exists, can be used to yield the electric circuit losses.

Considering the rotor, the mechanical losses are independent of the electrical operating conditions, provided that there are no large unbalanced radial and axial forces. Excitation losses are clearly only a function of the synchronous machine field winding resistance and field current.

Experiments confirm that the output-input method and the method of separation of losses give comparable results to within present limits of accuracy of measurement.

The method of separation of losses, although only an approximation, yields results which are considered more accurate—certainly more consistent—than those obtainable from the output-input method. Assume that the maximum percentage error of measurement of the input or output power or of any of the separate loss components is $\pm \epsilon$ %. An efficiency computed from the output-input method is then liable to a maximum error of $\pm 2\epsilon$ % absolute. On the other hand, an efficiency evaluated by the separation of losses is liable to be in error, due to measurements errors, by about $\pm \epsilon \dfrac{\text{losses}}{\text{output}}$ % absolute in the worst case. Taking as typical values an efficiency of 96% and a measurement error of ±2%, the former method gives a maximum efficiency error of ±4% absolute, whereas the latter method is liable to a maximum efficiency error, from measurement errors, of about ±0·08% absolute, i.e. approximately 50 times smaller.

## *Losses in a Synchronous Machine*

The losses which occur in a synchronous machine set will now be described. The assumptions and conventions agreed upon by the International Electrotechnical Commission (I.E.C.), and incorporated in most national specifications (e.g. Ref. 4), are also given.

FRICTION AND WINDAGE LOSSES.—This term includes the friction and windage losses at rated speed of the main machine and of the auxiliary machines which are directly coupled, the brush friction loss and the power input to direct-coupled mechanical devices. The friction and windage losses in the exciters, if separately driven, and the input to external ventilating fans, if fitted, are not normally included in this term. No allowance is made for the extra friction loss arising from the end thrust or weight of prime

movers or driven equipment. Thus in a waterwheel alternator the additional frictional loss due to the weight of the turbine runner and the hydraulic thrust is considered part of the prime mover losses.

CORE LOSS.—This term includes all losses occurring in the magnetic circuit of the machine at rated frequency due to hysteresis and eddy-current losses, caused by the magnetic flux; all losses produced by flux pulsation in the pole faces and damping winding, if fitted; and also all hysteresis and eddy-current losses produced by leakage flux elsewhere than in the magnetic circuit. The magnetic circuit includes the poles, the stator core laminations, the air-duct spacers and spacer plates, and the stator core-clamping bolts, fingers and flanges.

By convention, the core loss is measured at no load, at rated frequency and at the rated terminal voltage of the machine. The simplifying assumption is thus made implicitly that the core loss on open circuit (no load) and rated voltage is equal to that on full load and at rated terminal voltage. There is experimental evidence that this convention does not introduce significant errors. It could be argued that it would be more reasonable to measure the core loss at the internal voltage $E_i$ (Fig. 2) corresponding to rated terminal voltage, current and power factor. However, $E_i$ cannot be measured or derived experimentally.

STATOR WINDING $I^2R$ LOSS.—By convention this term is computed from the d.c. resistance of the stator winding at 75° C.

STRAY LOAD LOSS.—This term accounts for all stator winding losses additional to $I^2R$ loss (i.e. eddy and circulating-current losses), for all stray losses in the magnetic field of the load current flowing in the stator winding, and also for hysteresis and eddy-current losses in the end-winding structure. The end-winding structure includes winding-support rings and brackets, protection caps, air guides and air shields.

By convention the stray loss is assumed to be equal to the value obtained from a short-circuit test by taking the difference between the input power and the sum of the friction, windage and $I^2R$ losses, at the current under consideration, the machine being separately excited. The stray load loss is deemed to be independent of temperature: actually it decreases slightly with increasing temperature. There is experimental evidence that the stray load losses at rated power factor and on zero power factor over-excited are practically equal and somewhat less than on short circuit.

FIELD WINDING $I^2R$ LOSS.—By convention this term is computed from the resistance of the field winding at 75° C and the field current.

EXCITATION LOSSES.—This term includes all losses in the excitation circuit with the exception of the friction and windage losses of the exciters, which have already been accounted for under the appropriate heading. Included are also the electrical losses in the synchronous machine slip-ring brushes. All copper losses are evaluated at 75° C. This term accounts for the total losses of a separately-driven exciter set.

LOSSES IN THE AUXILIARIES.—This term accounts for the power input to the bearing oil circulating-pump motor and to the ventilating-fan motor, if these are fitted. It is not, as a rule, taken into consideration for efficiency calculations.

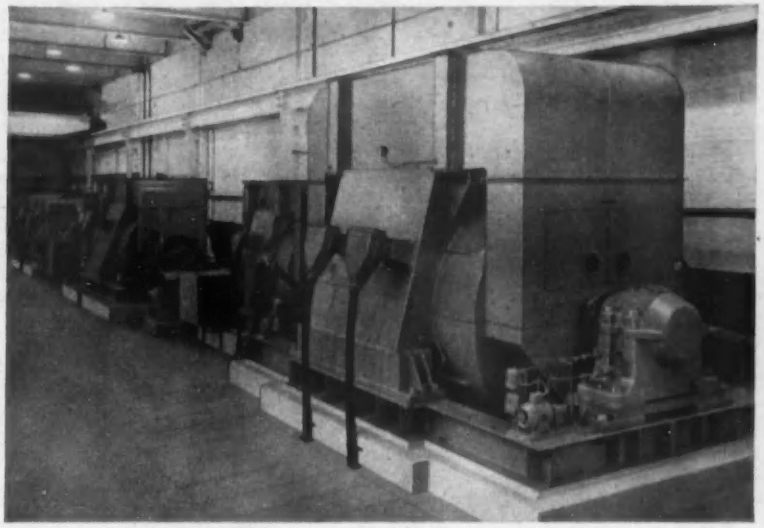


*Fig. 3. Test machine room, with 20 MVA alternator set in foreground*

## Loss Measurement

The following methods of loss measurement are available :—

(*a*) *Electrical :* Losses can be measured electrically and the methods which are employed are described in the next section.

(*b*) *Mechanical :* Dynamometers are quite widely used. It appears likely that torsion meters will find extensive application in the future and will perhaps supersede some of the electrical loss-measurement methods.

(*c*) *Calorimeter :* This consists in measuring the flow of air through the machine and the temperature rise of the cooling air. When a closed-circuit method of ventilation is used with an air/water cooler, the flow and the temperature difference between inlet and outlet of the cooling water are measured. The method, although generally used as a means of measuring losses by the method of separation, can be employed for the measurement of full-load losses.

It is not easy to measure the quantities involved to the necessary accuracy and the problem of satisfactorily allowing for convection and radiation presents serious difficulties. The method is restricted essentially to the testing of large high-speed machines, mainly turbo-alternators, on site.

(*d*) *Retardation :* This consists in evaluating losses from the results of a retardation test and a knowledge of the moment of inertia of the rotating masses. It is sometimes used for site tests. The method is however employed more often for the evaluation of the moment of inertia from a knowledge of the losses.

## Methods of Drive and Electrical Loss Measurement

The electrical loss measurement in a synchronous machine is inevitably connected with the method of drive and, for convenience, the two aspects will be dealt with simultaneously.

The synchronous machine should be run for a sufficiently long time to ensure that the bearings are run in and that the bearing oil temperature is reasonably constant. The machine under test must not accelerate or decelerate when

readings are taken. An accurate and continuously-indicating speed-measuring device, e.g., a stroboscope, is essential.

All auxiliary machines (e.g., exciters, starting motor, permanent magnet generator) are disconnected electrically and, where necessary, mechanically. Mechanical devices (e.g., directly-coupled oil pumps) operate in the normal manner. The excitation for the synchronous machine is supplied from a separate source.

The measuring current transformers can conveniently be placed at the neutral end of the stator winding in those cases where both ends of each phase of the machine are brought out to terminals. The current transformers need then only be insulated for a low voltage.

SEPARATE DRIVE.—This method consists in driving the machine under test at rated speed by means of a driving motor. By measuring the input to the motor and subtracting the losses in it, the losses in the machine under test can be determined. A synchronous or induction or a.c. commutator motor could be used but a d.c. motor is often more convenient and affords greater flexibility.

The machines and the meters are connected as shown in Fig. 4(*a*). It is convenient to feed the motor from two separate d.c. supplies. The field winding is connected to one, a constant-voltage supply; the armature is connected to the other, a variable-voltage supply. The field current is set to a convenient value and is then kept constant throughout a test, so as to maintain the core loss in the motor reasonably constant. The speed is kept at the desired value solely by control of the voltage across the armature.

The losses in the motor can be obtained by uncoupling it and running it light—light run— at the same speed and field current as when it was driving the synchronous machine.

Hence, equating losses, we have:—

$W = vi - i^2r - w$ (test).

$w = v_1 i_1 - i_1^2 r_1$ (light run).

where:

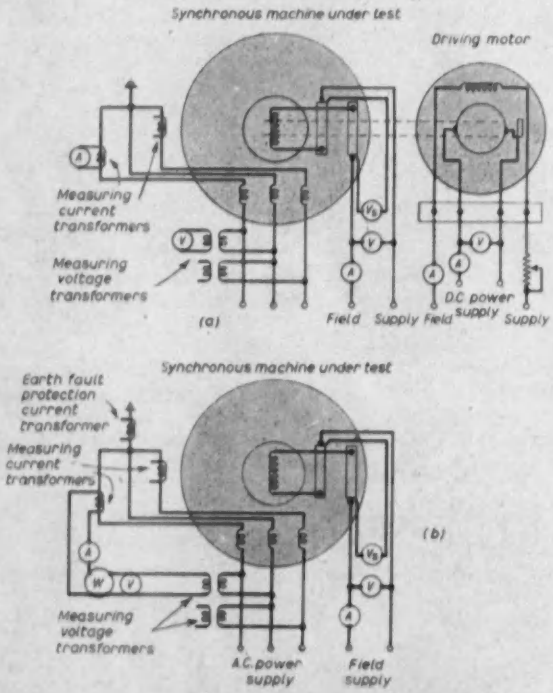



*Fig. 4. Methods of drive and measurement: (a—top) separate drive; (b—bottom) a.c. supply. $V_s$ is measured across the slip-rings*

W = loss in the machine under test.
v = supply voltage to the motor.
i = current in the armature of the motor.
r = resistance of motor armature including brushes, compoles and series field at the temperature of the winding during the test.
w = friction, windage and core losses in the motor.
The suffix 1 refers to the light run.

The advantages of feeding the motor from two separate supplies become apparent. Firstly, the losses in the motor field do not enter into the loss equation; secondly, assumption of constant w necessitates constant field current. Connection of the field winding to the variable-voltage armature supply would entail excessive adjustment of the field rheostat.

Tests at zero power factor over-excited involve the use of a bank of loading reactors. Saturable reactors are being used with success (Ref. 9). Alternatively, fixed reactors with series-parallel switching can be employed in conjunction with a make-up synchronous machine, which enables the discrete steps, caused by the switching of a number of reactors, to be bridged. This machine runs unloaded, is driven from the machine under test by being connected to it electrically, through a transformer if necessary, and has its excitation adjusted to give the necessary leading or lagging kVA. The kVA-capacity of the test plant must be comparable with the kVA-rating of the largest machine which may have to be tested.

The separate drive method permits of great accuracy but suffers from the disadvantage of causing difficulties of a practical nature in the factory, especially if the machine under test is of vertical construction. The motor must either be connected to the bottom end of the shaft, which necessitates a very deep pit, or at the top of the shaft, which entails removal of the exciters and thus some improvisation. Occasionally the main exciter is of sufficient capacity to enable it to drive the machine under test, at least for some of the tests, avoiding the use of a special driving motor. The addition of a few series turns to the main exciter field by means of temporary cables may result in a sufficient increase in starting torque and stability.

A.C. SUPPLY.—This method consists in driving the machine under test as an unloaded synchronous motor from a variable-voltage normal-frequency test supply and measuring the active and reactive power inputs to the synchronous machine.

The machines and the meters are connected as shown in Fig. 4(*b*). The operating conditions are obtained by adjustment of the test supply voltage and the excitation of the synchronous machine under test. During starting it may be desirable to supplement the a.c. starting torque with the torque of the main exciter, used as a motor.

Certain tests require operation, and the measurement of power, at unity power factor and the two-wattmeter method is then useful. On account of slight differences in the voltage waveshapes of the machine under test and the test supply, harmonic currents flow and it is more accurate to set the power factor by adjusting the excitation for equal reading of the two wattmeters.

Certain tests require the operation, and the measurement of power, at low power factors. Conventional wattmeters are not completely satisfactory at the low power factors involved (0·1 to 0·03). A.C. bridge circuits have been evolved for the purpose (see e.g. Ref. 7) and are used with varying degrees of success. The problem cannot be said to have been completely and satisfactorily solved.

There is often a tendency for hunting to occur with a slight cyclic power flow between the machine under test and the supply alternator. This action, although not clearly

understood, appears to be a function of the relative number of poles, and the relative kVA-ratings of the machine under test and the supply alternator. When swinging occurs the measurement of power is somewhat eased by the use of polyphase wattmeters.

The a.c. supply method is often more convenient than the separate drive method and, with care, yields as high an accuracy. The set under test can always be tested as a unit with all auxiliary machines coupled and this is no mean advantage. Often the separate drive and a.c. supply methods supplement each other. On the other hand, the test equipment necessary to provide supplies with the required degree of flexibility and kVA-capacity is large and expensive (Fig. 3). The test supply can, however, be used for the testing of other apparatus, e.g., transformers (Ref. 8). The test alternator must be capable of operating with complete stability at low leading power factors, with the use of reactors if necessary, and the kVA-capacity of the test plant must be comparable with the kVA-rating of the largest machine which may have to be tested.

BACK-TO-BACK.—When machines of comparable voltage and rating are built at the same time and are fully assembled in the factory, they can be tested by a combination of the two former methods. One of the machines is fitted with a driving motor and is tested by the separate drive method. It is then used to supply the other machine, which is tested by the a.c. supply method. The motor must now have sufficient capacity to supply the losses in both synchronous machines and this precludes, in general, the use of the main exciter for the purpose.

The great advantage of the back-to-back method is that a large supply of reactive power, often equal to the kVA-rating of the machine fitted with the driving motor, is made available to supplement, or to take the place of, test supplies.

BACK-TO-BACK WITH ROTORS MECHANICALLY COUPLED.—When two or more identical machines are built at the same time and are fully assembled in the factory they can be tested by a back-to-back method similar to the Hopkinson test for d.c. machines.

Fig. 5 shows the connections of the machines and of the meters. In this case it is preferable to provide the excitation from the exciters of the machines under test. The two machines are connected electrically at the couplings. By a suitable angular displacement of the rotors at the couplings, the machines can be made to operate at rated voltage and power and at substantially rated power factor, one machine acting as generator and the other as motor. The machines are on full load but the power expended during the test is only that corresponding to the sum of the losses in the two machines. The losses in the two machines can be assumed to be equal. The combined losses can be supplied mechanically by a driving motor, connected to one of the machines, and they are then measured electrically, as for the separate drive method. Alternatively, and usually more conveniently, the losses are supplied electrically from a test supply, connected to the common terminals, and measured by precision wattmeters as for the a.c. supply method.

## *Characteristic Curves, Losses and Field Current*

Tests to determine characteristic curves, losses and field current may be considered with separate drive and with a.c. drive. In each case, there are two sets of tests to consider: open circuit (OC) and short circuit (SC) saturation tests with losses, or their equivalents; and zero power factor over-excited (Zero pf) saturation tests.

Separate drive methods will be considered first.

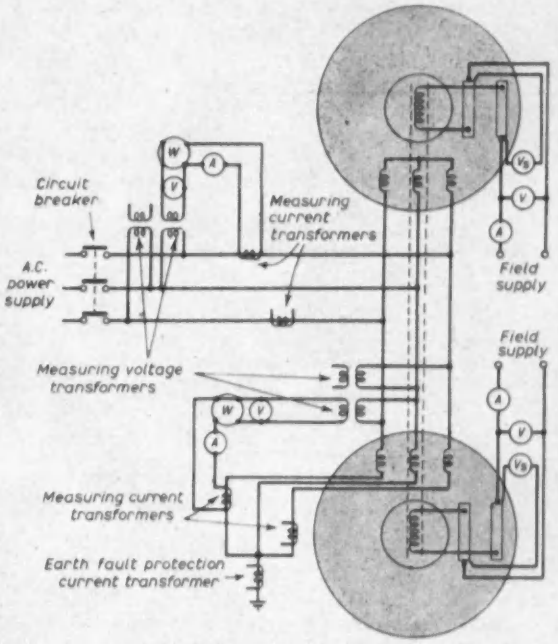



*Fig. 5. Methods of drive and measurement : back-to-back arrangement with rotors connected mechanically. $V_s$ is measured across the slip-rings*

OC AND SC SATURATION TESTS WITH LOSSES.—These tests consist in driving the machine under test as an alternator at rated speed with a driving motor, and in taking readings of electrical input to the motor and OC voltage and SC current respectively of the synchronous machine, corresponding to various values of alternator excitation (including no excitation). A light run follows each of these tests, if necessary.

In the OC test the machine is driven with the stator winding open-circuited and readings are taken of field current and stator voltage on the synchronous machine, and input to the motor. No current flows in the stator winding and thus the friction and windage loss of the machine under test and any coupled machines (exciters, etc.), and the core loss of the synchronous machine can be evaluated by difference.

In the SC test the machine is driven with the stator winding short-circuited and readings are taken of field current, stator current and stator winding temperature on the synchronous machine, and input to the motor. The friction and windage loss of the set, and the stray load loss of the synchronous machine, can be evaluated by difference.

Hence, with a d.c. driving motor:

$$W_{FW} + W_C = v_o\, i_o - i_o^2 r_o - w \quad \text{(OC)}$$

$$W_{FW} + W_S + 3I^2R_s = v_s\, i_s - i_s^2\, r_s - w \quad \text{(SC)}$$

$$w = v_l\, i_l - i_l^2 r_l \quad \text{(light run)}.$$

The suffixes o, s and l refer to the OC, SC and light run test respectively.

The suffixes FW, C and S refer to friction and windage, core and stray load losses respectively of the synchronous machine. The symbols not previously defined are:

I = stator current in each phase of the synchronous machine.

R = phase resistance of the synchronous machine at the temperature of the winding during the test.

The term $W_{FW}$ is obtained from a reading with no excitation on the synchronous machine. The term $3I^2R_s$ is calculated for the resistance corresponding to the temperature of the winding during the SC test.

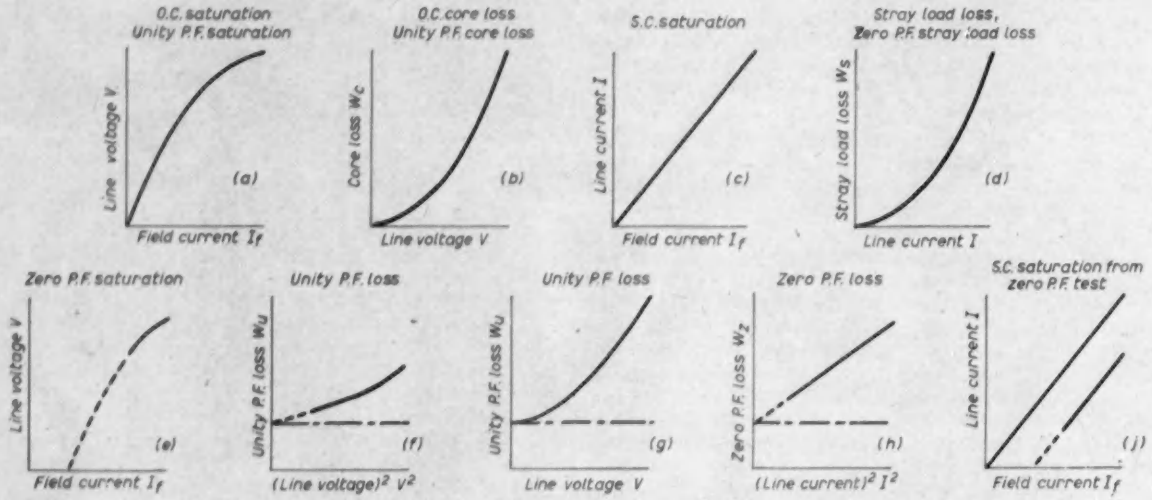



*Fig. 6. Some characteristic curves obtained in the testing of large synchronous machines*

The following important curves can be plotted:

(i) Variation of OC stator voltage with field current (OC or no-load saturation curve, Fig. 6a).

(ii) Variation of OC core loss with stator voltage (OC or no-load core loss curve, Fig. 6b).

(iii) Variation of SC stator current with field current (SC saturation or SC impedance or synchronous impedance curve, Fig. 6c).

(iv) Variation of stray load loss with stator current (stray load loss or SC core loss curve, Fig. 6d).

ZERO PF SATURATION.—This test consists in operating the synchronous machine as an alternator at Zero pf lag (over-excited) and in taking readings of field current for rated line current at a few values of stator voltage near the rated value.

The curve that can be plotted is: variation of line voltage with field current for full-load stator current at Zero pf over-excited (full-load Zero pf over-excited saturation curve, Fig. 6e).

Separate drive methods having been considered, the corresponding tests with a.c. supply remain to be dealt with.

UNITY PF AND ZERO PF SATURATION TESTS WITH LOSSES.—These tests consist in driving the machine as an unloaded synchronous motor from a rated-frequency test supply. Readings are taken of line voltage, line current, power input and excitation of the machine under test.

In the unity pf test the machine is supplied from a variable-voltage supply and the excitation at each voltage is adjusted for equal readings of the two wattmeters. (See page 386.) Readings are taken down to the lowest voltage at which synchronism is maintained. Very little current flows, so that that the $I^2R$ loss can be neglected, and the internal voltage is practically equal to the supply voltage. Thus the Unity of pf test is an alternative to the OC test and is found to yield results which agree closely with it.

In the Zero pf test the machine is supplied from a constant-voltage supply and the excitation is adjusted to give various values of stator current. Readings are taken at the lowest voltage which will ensure stable operation (say $\frac{1}{8}$ to $\frac{1}{4}$ of the rated voltage of the machine under test) for various values of stator current up to full load, in the over-excited region. Readings are also taken of the stator winding temperature. The machine operates at a low stator voltage so that there is little saturation, and also at a low power factor over-excited; conditions during the sc test are very similar. The Zero pf test is thus an alternative to the SC test and is found to yield results which agree closely with it.

Hence:

$$W_u = W_{FW} + W_C$$
$$I_{fu} = I_{fo} \quad \text{(the stator current is small)}$$
$$W_z = W_{FW} + W_C + W_S + 3I^2R_z$$
$$I_{fz} = I_{fs} + I_{fu} \quad \text{(the machine operates at a low — theoretically zero — power factor, over-excited and at a low voltage).}$$

The suffixes u and z refer to the Unity pf and Zero pf test respectively. The suffixes o and s refer, as before, to OC and SC conditions.

The symbols not previously defined are:

W=power input to the machine under test.

$I_f$=field current of machine under test.

If the Unity pf loss $W_u$ is plotted as a function of the square of the stator voltage V a curve is obtained which is linear at low values of V (Fig. 6f), since, at low flux densities, the core loss is approximately a function of the square of the flux density, and thus the square of the stator voltage. It is possible to extrapolate the Unity pf loss curve to zero voltage and determine the term $W_{FW}$.

If the Zero pf loss $W_z$ is plotted as a function of the square of the stator current I a straight line is obtained (Fig. 6h), since the stray load loss varies very nearly as the square of the stator current and since, at low stator voltages, the core loss $W_C$ can be considered to be independent of the stator current. It is thus possible to extrapolate the Zero pf loss curve to zero current. The term $3I^2R_z$ can be calculated for the resistance corresponding to the temperature of the winding during the test so that the stray load loss $W_S$ can be obtained by difference. Alternatively the terms $W_{FW}$ and $W_C$ can be obtained from the results of the Unity pf test.

If, for a synchronous condenser, the Zero pf test is performed at the rated stator voltage and the excitation is provided by its own exciters, the full-load losses are obtained directly.

The field current on SC $I_{fs}$ can be obtained by subtracting from the field current $I_{fz}$, measured during the Zero pf test, the field current $I_{fu}(=I_{fo})$ from the Unity pf test corresponding to the stator voltage during the Zero pf test. Alternatively a curve can be plotted relating the stator current I to the field current $I_{fz}$ during the Zero pf test, actually a straight line. A parallel to this straight line drawn through the origin will yield the SC saturation curve (Fig. 6j).

The following curves can be plotted:

(i) Variation of stator voltage with field current. (Unity pf saturation curve, commonly referred to as OC or no-load saturation curve, Fig. 6a).
(ii) Variation of Unity pf loss with stator voltage (Unity pf loss curve, Fig. 6g).
(iii) Variation of Unity pf core loss with stator voltage. (Unity pf core loss curve, commonly referred to as OC or no-load core loss curve, Fig. 6b).
(iv) Variation of SC stator current with field current. (SC saturation or SC impedance or synchronous impedance curve, Fig. 6c).
(v) Variation of Zero pf loss with stator current. (Zero pf loss curve, Fig. 6h).
(vi) Variation of Zero pf stray load loss with stator current. (Zero pf stray load loss curve, commonly referred to as stray load loss or SC core loss curve, Fig 6d).

ZERO PF SATURATION TESTS.—This test is exactly similar to that described on page 388 and is an equivalent to it except that the machine is operated as an unloaded synchronous motor at Zero pf lead (over-excited).

(*To be continued*)

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# READERS' VIEWS

*Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor*

## *Heating in Churches*

MY Council would be interested to hear from any heating engineers or electrical contractors amongst your readers who have had experience of heating churches within the last five years, in order that they might have the benefit of their experience in this matter. This request is made in conjunction with the recent publication by the Council of a report on this subject. Any information sent to the address given below will be gratefully received.

*J. Scott,*
DEPUTY SECRETARY, CENTRAL COUNCIL FOR THE CARE OF CHURCHES, DUNSTER, SOMERSET.

## *Portable Tools*

THE recent letters published by you concerning safety measures to be taken with portable electric tools surely miss the point. No matter how safe a tool is, it is bound to become dangerous if it is used negligently. The obvious way to prevent the sort of accident described is never to let wagon wheels come into contact with electrical cables.

Methods of preventing such an occurrence are so simple that they are often ignored in the face of expensive solutions which are still not entirely foolproof. Such methods would be the provision of an adequate number of power points so that cables for portable tools need not cross gangways, and if cables must cross gangways, they can easily be protected by suitably shaped covers made of bakelised fabric.

Such precautions may cost a few pounds or a few seconds, but when they mean the avoidance of loss of life or disablement they are very cheap.

*A. S. Hay,*
ZURICH.

## *Earthing and Sickness*

THERE has recently been some correspondence in the motoring journals on the subject of earthing cars as a remedy against car sickness. I have been assured by no less than four people of undoubted integrity—one lawyer, two electrical engineers and one garage proprietor—that they have all found that an earthing chain or cable was a certain cure. In fact the garage proprietor has gone so far as to earth his fleet of hire cars and claims that he has had successful results with dogs which were usually sick when travelling. As far as I can see there would appear to be no connection between electricity and car sickness, which is usually attributed to optical or physical discomfort due to motion. I myself do not suffer from the malady, but I feel that some more data would be welcomed; perhaps some of your readers may have some theories on the matter.

*"Curious,"*
LONDON, S.W.11.

## *Effective Inspectors*

HAD your correspondent "Megger" revealed his identity in his letter published in your issue of 24th February, I should have been delighted to deal with his comments in detail.

Consequently I confine myself to two observations:

(1) I challenge the correctness of the statements in "Megger's" two-part answers.
(2) Apparently he is unaware of the existence of this Register, which is 100% impartial and with a fully qualified inspectorate dealing with every aspect of electrical installation work.

*F. W. Purse,* M.I.E.E., M.I.MECH.E.
HON. DIRECTOR, N.R.E.I.C., LONDON, S.W.1.

# *Electrical Engineering* and Britain's Economy

FUTURE PROSPECTS DISCUSSED AT I.E.E. MEETING

ELECTRICAL engineering occupies a prominent position in the country's economy, and is particularly important in the export field. A review of the industry's achievements in this setting was presented to the Institution of Electrical Engineers on Thursday last by Mr G. L. E. METZ, M.I.E.E., M.I.MECH.E., whose paper was a follow-up to an earlier treatment of the problem by himself and a fellow-author in 1946.

The paper is in three main parts. The first outlines the general economic background at the present time, and the position occupied by the electrical industry in the general pattern of trade. Next comes a reference to general problems affecting production, research and exports, with some comments on the objectives to which the industry is progressing. Finally, the author deals with the strategy for achieving these objectives and for making the best use of the resources at the disposal of the industry.

The arguments developed in this examination of a complex problem are not readily summarised, and here attention will have to be concentrated on the author's conclusions. Apart from the effect of a decision by the country as a whole to increase productivity, he considers that there are certain factors special to the electricity industry. Foremost amongst these is the change in the principal sources of energy, which is unmatched by any trend away from electricity as the means of distributing power. In addition, labour is getting more expensive, and the fact that it is cheaper to hire plant than to hire labour is widening the field in which electrical labour-saving devices can be economically applied. Finally, with the intensifying of the fight for markets, production and exports can only be increased by making productivity here higher than it is in countries with which we have to compete.

## *Improvements in Productivity*

To obtain a worth-while improvement in productivity, the author suggests that there must be a greater willingness to use effectively new methods and labour-saving devices, and a determination to act as a team rather than as isolated groups of individuals not wholly sympathetic one with another. In part, the absence of these pre-requisites seems due to the failure of engineers to explain to management and workpeople concerned with production the advantages offered by new machines. "It is not enough to say that the new machine will do twice as much work as the old one; the operator must also be told how this will affect him and the community he serves." The present situation, Mr Metz considers, arises from the fact that industry and the people working in it no longer have a clear objective that they feel is worth working for. The engineer, on his part, finds it hard to realise that by the application of technical knowledge he has the power to improve the lot of the predominently very poor people who inhabit the world.

It is a mistake, the author says, to assume that the repository of all knowledge lies in the United States. If that country has learnt how to increase productivity, Great Britain has learnt to make many things better and far cheaper.

However, the investment devoted to research seems too small, and it is by no means certain that the present research effort is concentrated upon the things that matter most. In the present situation, it seems to the author that research should concentrate at the working level on the development of new and improved labour-saving devices for use in the home and factory at prices that people can afford. This approach would have the advantage of helping to increase exports.

## *Discussion*

The discussion on this paper was opened by Colonel B. H. LEESON (B.E.A.M.A.), who claimed that there was no industry in the country more closely knit with cohesion than the electrical industry. Of all the industries which could pull the country out of its present state, the electrical industry led. Exports of the electrical industry had risen by 3½ times in quantity compared with pre-war. Since 1948 the production achieved by the country had risen by one-third. This increase in production generally could never have come about had there not been the capital investment in the electricity supply programme and more electricity used in industry generally.

The electricity industry certainly planned ahead, and it knew where it was going. Its main objectives were to make electricity to the benefit of humanity and to make the country stable so that it was solvent and could do good in the world.

The author, Colonel Leeson remarked, had commented that the demand for electricity had far exceeded the capacity for producing it. To this should be added "and the means for paying for it." Countries overseas had all kinds of projects in mind but were not yet in a position to pay for the electrical equipment they wanted, and this country had not been quite rich enough to be able to capitalise them.

After many further comments on the author's remarks, Colonel Leeson concluded with a call for more two-shift working, so that available capital equipment might be put to greater use.

Continuing the discussion, Mr. H. J. BEARD (Merz and McLellan) said that because of the depletion of our capital resources, the initiative in maintaining our overseas trade rested much more than it did previously on the British engineering industry. In that work the consulting engineer had a significant part to play in continuing to provide the export of technical services. By assisting in the construction of schemes at home, consulting engineers obtained invaluable experience which they could use in their overseas work, and what was done at home provided a shop window for potential customers overseas.

At the end of the discussion, after various other speakers had taken part, and the author had replied, the President suggested that if executives organised their lives properly they would be able to do as much work as at present, and yet leave 50% of the executive side free to concentrate on the export drive.

# notes on wiring

by Megohm

IN these Notes dated 10th February, 1955, I expressed my opinion of the H.M.S.O. publication "New Homes for Old, Improvements and Conversions." This handbook was published for the Ministry of Housing and Local Government and deals with electrical installations which can qualify for grants under the Housing Acts of 1949 and 1954.

My main criticism of this handbook was the matter of inspection of the completed installation. Although recommending that the existing installation be inspected by "a competent electrician" and the whole matter discussed with the local electricity board, there is no stipulation that it be inspected *after completion, by a competent engineer.* This, I maintain, is necessary as the grants for such work come from public funds. It is not sufficient for the authorities to rely on the usual test, etc., carried out by the local board at the time of connection.

These remarks of mine were in turn criticised by a Lancashire reader in Readers' Views in the ELECTRICAL TIMES dated 24th February. In my opinion, this reader really got my views round the wrong way. He proceeded to detail the service given by the Inspection and Testing Departments of the local electricity boards. The services rendered by these units, as detailed in the letter, are in fact the very thing which I was asking for. This would prevent bad practices which prevail in contracting circles. I realise that most contractors carry out their work in a correct manner, but there are certain firms who make a practice of hiding bad wiring, etc., and the ordinary test carried out on connecting up the supply does not reveal this. Here was an ideal opportunity to remedy this, but it has either been ignored or neglected.

## Registration

Recently the news was released that a remedy for bad wiring practice might at last become a reality. The National Inspection Council for Electrical Installation Contracting is to be set up and whilst few details are available at present, it does bring a ray of hope to those who see the evil of cheap, inferior installations. Many shady contractors will no doubt steer clear of this move but if the matter is conducted properly and public support obtained, then we may well see the end of the amateur electrician and the incompetent contractor.

It is to be expected that registration will be voluntary and I hope that when this begins the popular press will take the matter into the homes of the everyday user of electricity. Whilst they are doing so, I hope that they themselves will stop their practice of printing ideas of their readers which are, to say the least, dangerous.

It appears that registration is to be confined to firms rather than to individual wiremen, which means that the Council will have to ensure the maintenance of adequate standards by its members. I, personally, would like to have seen some approach to the registration of individual wiremen, but no doubt this suggestion will meet with disapproval and references to freedom, etc. Perhaps it would be wiser on my part to leave the matter there and await the results of the Council. I only hope that the results and the plans are something really worth while.

## Electrical Exhibition Features

I am now gradually collecting advance details of new features which will be on show at the Electrical Exhibition, which opens at Earls Court on the 15th of this month. The manufacturers have not released all their secrets but there are certain accessories which I feel are worth looking out for: the exhibition generally is of course reviewed extensively elsewhere in this issue. One manufacturer will have on view 5 amp plaster depth flush a.c. switches in one to three gang assemblies at very competitive prices. Also 5-amp surface insulated a.c. units up to four gang which, it is claimed, are particularly suitable for conversion work with surface wiring. A range of flush sockets with *hinged flaps* in 2, 5, 13 and 15 amp sizes should prove interesting.

Also on show will be what is claimed to be the smallest panel-mounting contactor on the market. This complies fully with B.S.775 for breaking capacity, is C.S.A. approved and conforms with American N.E.M.A. specification. It is made in three sizes, 30, 50 and 100 amp at 550 V a.c. rating. I have not actually seen this contactor and am certainly looking forward to examining it thoroughly. Another firm will be exhibiting a small isolator for motor control gear which is also small in dimension. The size is 4¼ in. x 3¼ in. x 1 13/6 in., it is t.p. and rated 20 amp 500 V. The actual isolator fits into a metal box which has ¾ in. knockouts on the top, bottom and both sides. The isolator complies fully with Electricity Regulations.

One switchgear manufacturer who last year introduced a new range of switchgear, which I may say is very good indeed, will exhibit fuse-boards to match. Incidentally, the isolating switches in this range have possibly the most unobtrusive padlocking location of all switchgear. The padlock is sited just under the top fastening screw on the lid. This firm will also have on show a single gang switch with an ingenious device for levelling the plate. This is so new that, try as I could, the secret remained with the manufacturer. Another switchgear manufacturer will be showing a new range of flush and surface fuse-boards which are of a neat appearance and have a door fitted with a rubber gasket which makes it dust-tight. This fuse-board can be obtained in 15, 30, 60 and 100 amp 500 V sizes.

One of the well-established accessories manufacturers have a new line in industrial switches which feature removable grids for quicker wiring, easy access and ample room for cables, and rust-resisting seamless boxes. This is only one of the new designs on show by this firm, but I am certain that they will interest the engineer.

The floor space to be occupied by stands this year is 250,000 square feet, and the amazing variety of electrical equipment that will be displayed should satisfy the interest of the most ardent engineer. I only hope my limbs last out the distance and that I am not too exhausted to describe the exhibition in my next Notes.

# *Wiring in Australia*

TECHNIQUES DOWN UNDER SEEN THROUGH ENGLISH EYES

***In this article, an installation inspector now working in New South Wales comments on the rules and regulations covering wiring work there, as they appear to him in the light of earlier experience on similar work in Great Britain.***

SOME of the wiring practices current in Australia seem quite strange to an electrician used to British methods. Many installations in these parts are wired in t.r.s., p.v.c. and grip conduit. Looping in 3-plate ceiling roses or looping of neutrals at the switches is common practice in Australia. P.V.C. tubing is used a great deal to protect wiring including that buried in the ground. Socket-outlets for use in domestic installations are rated at 10 amps and are required to be controlled by an individual switch, both for a.c. and d.c. systems. The Standards Association of Australia Wiring Rules allow up to 15 of these socket-outlets or general purpose outlets as they are called, to be wired on a 1/·064 or 3/·036 final sub-circuit which seems excessive to one brought up on British practice. One has only to think of the results if say a 3 kW fire is used off one of the socket-outlets in one room, and in the kitchen a small 2·4 kW cooker together with a 2·4 kW wash boiler, and a 1·5 kW hot water system as well as other appliances.

The rating of 3/·036 and 1/·064 cables given in the S.A.A. rules is 15 amps, so from the above possible loading of the appliance you would have approximately 34 amps on the 3/·036 or 1/·064 final sub-circuit, apart from the possibility of other appliances being used at the same time. The S.A.A. rules allow a diversity factor for these sockets. The first socket is rated at 1,000 W plus 2/5 of the capacity of the next four socket-outlets in order of rating, plus 1/10 of the capacity of the remaining socket-outlets up to a total of 15 socket-outlets in all.

## *Socket-Outlets in Bathrooms*

Another practice which seems dangerous is that of allowing socket-outlets in bath rooms. They are permitted to be mounted at the side of the bath or other convenient position. In addition, switches which can be reached while standing in the bath are permitted together with switches fixed at the side of a shower; such showers in most cases have a stone floor. Reverting to socket-outlets, the S.A.A. ruling for these may have been reasonable in the days when electricity was used for lighting or the radio, but with the many other appliances common nowadays, the rule seems due for amendment.

There is a good rule in regard to the earthing of socket-outlets: the use of the conduit is not allowed for the earth continuity conductor. A separate earth wire, wired from the main neutral link at the switchboard on a M.E.N. system is taken to the first socket-outlet, then looped from there to the next remaining socket-outlets. This seems an admirable arrangement considering the poor electrical continuity which can be obtained from some grip conduit, and screwed conduit on occasion as well.

Another common practice is the use of a ceiling rose with tumbler switch to control it as a socket-outlet. An appliance up to 100 W is allowed to be fed from such a point. Such outlets are used a great deal where an element type refrigerator is granted a low tariff and has its own meter. They are called "special purpose outlets."

Switchboards for small industrial and domestic installations in most cases are of the type where the contractor assembles the fuse carriers and main switches himself. Such main switchboards have their merits in some instances, but some seem like a handyman's job in appearance. They consist in many cases of a box arrangement in non-inflammable enclosure. A switchboard for a small domestic installation might be made by mounting one 10 amp fuse box and carrier for the lighting circuit, one 15 amp fuse box and carrier for the socket-outlet circuit and one 15 amp fuse box and carrier for the water heating system. These circuits would be controlled by a main switch; in some cases this is a 25 amp tumbler type switch. Mounted on the panel is a neutral link. The connections at the back of some of these switchboards allowed by some supply authorities are a conglomeration of joints, as the fuse boxes are not linked together with a busbar and as circuits mount up, a maze of joints and wires accumulate at the back of some of these switchboards.

I must admit these types of switchboards in the part of New South Wales where I am at present are a type far superior to the ones commonly used in parts of Queensland. At least one reputable manufacturer in Australia seems to make quite a good type of switchboard including meter panel and metal case. I must state that these switchboards are not supplied with any of the fuses or main switches; these components, as stated before, are assembled by the contractor. This type of switchboard has its merits, but also most definitely its drawbacks. It is not as neat as the British consumer type of switchgear, and on many types of jobs a splitter-type switch could be used with saving of space and time, for there certainly is a lot of time wasted in drilling holes in panels for the usual bases and switches, etc., besides soldering and taping points at the back of the switchboard. Some manufacturers have put on the market a type of splitter switch, and other types too, but they have been of a crude design as compared with British standards of switchgear. There is certainly plenty of opportunity for some manufacturers to design something more substantial than the other primitive type described.

## *Earthing*

The M.E.N. system is used a great deal out here. According to the S.A.A. Wiring Rules it is permissible to earth the installation on to the supply authority's main neutral link. This neutral link is also connected in some cases to the main water pipe or to an earth electrode depending on whether the installation is situated in the town or rural area. Some supply authorities do not allow any connection to the water pipe, only an earth electrode. These earth electrodes are not so bad providing they are in good soil, but many of them are not so situated. One can imagine the danger if the supply authority's main neutral becomes adrift and there is a fault to earth. The electrode then becomes alive with, in some cases, almost the full 240 V potential to earth. In this area very little use is made of the e.l.c.b., although there is room for discussion as regards whether this or M.E.N. is safest.

The S.A.A. lays down the rule that the electrical resistance of the earthing system measured from the connection to the water pipe or earth electrode to any point on the conduit or other conductor enclosures shall not exceed 2 ohms for a new installation and 5 ohms for an old installation, which seems strange in some ways, as one would expect the old installation to be as important as the new installation. In addition to the foregoing, the electrical impedance of the earthing system, measured from the connections at the water pipe or earth electrode to any point on the conduit enclosures, must not exceed 2 ohms measured at the supply frequency. No description of how the necessary test is carried out is given in the S.A.A. Wiring Rules.

### *Supplies to Outbuildings*

In an installation where earthing of equipment, etc., is required in outbuildings or structures remote from the building or structure containing the main switchboard, and where buildings are connected by means of aerial conductors, the aerial neutral conductor may be used as an earth bonding conductor. The detached portion of the installation has then to be regarded as a M.E.N. installation in itself, and be provided accordingly with an earth electrode. In this case the neutral conductor must not be smaller than 7/·044 or smaller than the largest active conductor above this size supplying the detached portion, except that neutral conductors of larger cross-section than 0·035 sq in. (7/·080 in.) need not be more than half the cross-section of the largest active conductor. When t.r.s. or p.v.c. cables are run in conduit in an earth situated position, the conduit is not required to be earthed. 3-phase motors of small size can be wired in t.r.s. or p.v.c. without mechanical protection except when likely to be exposed to sunlight or mechanical damage.

Some supply authorities allow consumers' mains, that is the point of attachment from the overhead lines to the switchboard, to be run in t.r.s. or p.v.c. These mains are run through the roof space or down the wall to the switchgear, whichever is convenient without further protection. One can imagine the number of consumers who would tap this line if it was common practice in Great Britain. Having had experience of people in Great Britain drilling into iron-clad cut-outs trying to obtain free electricity, it is remarkable that I have found no such case up to the time of writing of people trying such tricks in this country.

Wiring of cookers in some areas are on 3-phase or 2-phase according to the loading of the overhead mains. These stores can be wired direct without the need for a cooker control switch, reliance being placed on the control of the cooker's own individual switches.

### *Miniature Circuit-Breakers*

Some supply authorities require circuit-breakers to be installed on domestic installation especially in rural areas. These are of the miniature over-current thermal and magnetic types. The idea of using these miniature breakers in rural areas was to stop consumers telephoning the supply authority when a fault occurred on their installation point. However, in many cases they defeat their object: often before the breaker trips, the h.t. fuses at the transformer will have blown, therefore still necessitating the stand-by electrician being called out. These circuit-breakers are of American design and one cannot help but think there is room here for the British manufacturers to enter the market.

Summing up the wiring practice and S.A.A. Rules, there certainly is a great difference from British practice, and it it difficult to avoid favouring British electrical installation practice carried out to the I.E.E. Wiring Regulations, which is the safest and soundest one could find in the world. One must admit though, that there are several good ideas carried out in wiring practice here according to the S.A.A. rules; one particular rule which I feel sure the I.E.E. could adopt with advantage is the one about labelling the earthing conductor; and there are many others. This particular rule requires that every earthing conductor shall be labelled at or immediately adjacent to the point at which it is connected to the water-pipe electrode, or other earthing means. Such label shall be of metal which will not corrode, with the words *Earthing Conductor—Do Not Disconnect*, a good reminder for our friend the plumber.

A t.r.s. cable called speed wire is quite widely used to facilitate quick and simple installation by contractors. In installing it, the cores are divided by the simple operation of tearing apart. After division in this manner, each v.r. insulated core is completely surrounded by a tough rubber sheath and is, in effect, identical with single core v.r. insulated and tough rubber sheathed cable. The ends are prepared and fitted into the terminals of the fitting without the necessity of any further protection. I remember such a cable manufactured in England some years ago.

As an illustration of how the circuit-rating rules work, the example may be considered of a 240 V 1/·064 in. mixed final sub-circuit protected by fuses. The permissible connected load is calculated by first considering the total power available for the 15 amp cable rating, that is, 3,600 W. At 1,000 W per socket-outlet, there can be three such outlets, leaving 600 W for the lighting circuit: say 10 lighting points at 60 W each.

Such a mixed final sub-circuit does not seem good practice, and it is hard to imagine the I.E.E. permitting anything of this sort, when it is remembered that a 15 amp fuse is protecting the whole circuit, lighting as well as socket-outlets.

### *Cost*

The cost of installation work is quite expensive in this part of the world, for the consumer must buy his own meter board and pay for his own consumer mains. Electricians in most Australian States have to hold a licence to carry out electrical work, though this is not sure proof that the public are going to get a good job done. A licence in one State is only good for that State alone.

The two States I have covered have been Queensland and New South Wales, whose wiring rules are those of the Standards Association of Australia. In the State of Victoria, Wiring Rules and Regulations are framed around the 1950 edition of the Victorian Wiring Regulations. Incidentally, Victoria is considered by many to carry out the best electrical work in Australia, New South Wales following after. Also Victoria, one is led to believe, is the hardest State in Australia to pass the examination for an electrician's licence.

**Electricity Supply Handbook**

*The 1955 edition is now available. Completely revised and enlarged, a new 23" x 15" coloured map of the main transmission network is included. It provides an up to date list of the principal officers of the B.E.A., the Divisions, Area Boards and the North of Scotland Board. Copies price 7/6 each may be obtained from the Offices of the 'Electrical Times'.*

# IRON LOSSES AT HIGH FLUXES

## *I.E.E. DISCUSSES NEW METHOD OF EVALUATION*

ALTHOUGH iron losses in electrical sheet steels have been thoroughly investigated up to a magnetisation value of 1·8 Wb/m² at 50 c/s, above this figure scant information is available. This is due, in the main, to the method by which such information has been obtained. Using the usual dynamometer or electrostatic wattmeter, fairly accurate measurements can be made with flux densities up to 1·5 Wb/m² but difficulties introduced by the effects of low power factor and increasing harmonics lead to inaccuracy at higher values, though this method has been used with fair success up to 1·8 Wb/m². Similar experiences have been recorded with rotating disc methods of determining hysteresis loss and with the use of calorimeters for measuring iron loss. To rotating machine manufacturers, the performance of core steel at extreme magnetisation values is of particular interest since in the rotor and stator teeth, flux densities of the order of 2·0 Wb/m² and greater are experienced.

In a paper read last week at the Institution of Electrical Engineers, a thermal method of determining the iron losses of sheet steels with flux densities up to 2·4 Wb/m² was described. This paper entitled "Iron losses at high magnetic flux densities in electrical sheet steels," by Professor F. Brailsford, PH.D., WH.SCH., and C. G. Bradshaw, PH.D., in addition to describing the thermal method, also develops mathematical expressions with which it is hoped that it will be possible to determine the losses at high magnetisations by having knowledge of performance at flux densities up to the knee.

The new method is essentially one of comparison. A magnetic strip specimen is arranged in the centre of a stack of laminations and the whole is enclosed in a coil. Adjacent to the specimen within the stack but separated from it by nichrome covered with empire tape, is a non ferro-magnetic strip of resistance material through which an alternating current is applied. Thermo-junctions attached to each strip are connected differentially to a detector. When the coil is energised, the magnetic specimen heats up due to the losses and, similarly, when current flows through the resistance strip it too increases in temperature. By adjusting the current through the resistance until a null-reading is obtained on the detector, then the rate of rise of temperature in both strips may be said to be equal. It is assumed that there is no loss of heat from either strip and that the materials have the same specific heat. Since the power input to the resistance is known then the iron loss can be determined.

To ensure that errors were kept to a minimum all tests were carried out over 4-second periods only, and a specially developed d.c. detector of high accuracy was used. This consisted of a galvanometer-amplifier which depended for its operation on a light beam reflected from the mirror of a primary galvanometer acting equally on a pair of selenium-iron photocells. With the difference voltage of the thermocouples applied to the primary galvanometer, the photocell balance was disturbed and a second galvanometer was deflected. The detector sensitivity was about 700 mm/microvolt.

Measurements were made on 10 different core steels used in transformers and motors. The results obtained at 50 c/s indicated that the hysteresis component of the total loss for iron, silicone-iron and cobalt-iron reached a saturation value at high flux densities. An empirical relationship between hysteresis loss and intensity of magnetisation is proposed for the upper part of the loss curve and for use with hot-rolled non-oriented silicon-iron materials. This is in such a form that the upper part of the loss curve may be predetermined if the lower part is known.

On the same evening, a paper "An improved precision permeameter," by C. D. Mee, PH.D., and R. Street, M.SC., PH.D., was discussed, it deals with a new permeameter designed to determine losses in core plate.

### DISCUSSION

DR L. G. A. SIMS (The University, Southampton) described the work on iron losses as most excellent and ingenious. He thought it would be agreed by representatives of large steel manufacturing concerns that hitherto and possibly still at the present time information was not available about the specific heat or the heating capacity of packs of magnetic laminations; there were cases where this quantity could be really important. The authors had pointed out that the difficulty could be overcome with their experiment. It would be interesting to know with what degree of accuracy the authors' experiment could be repeated.

MR R. G. MARTINDALE (Metrovick) stressed the value to the machine designer of the paper on iron losses. It was the first time they had been measured at densities of the order of 23,000 or 24,000 gauss.

PROF J. T. MACGREGOR MORRIS (formerly Queen Mary College) said that methods for determining losses in sheets ranged from whole sheets down to crystals. The paper on iron losses was an intermediate paper. When one looked at a magnified image of a polished surface of a sheet, one realised what an extraordinary conglomeration of material it was. There were crystals, some in one plane, some at right angles, and inclusions between the crystals. The results must necessarily be a kind of average.

MR C. E. WEBB (National Physical Laboratory) said in regard to the paper on iron losses, he was interested in the application of the results to practical commercial testing, but it seemed almost impossible that a method of this kind could be adopted for this purpose. The techniques were difficult to apply on a routine basis and the test itself was really a spot test of the material.

MR O. I. BUTLER (University of Sheffield) said that people in general did not seem to be aware that at high flux densities in particular one could keep the form factor constant and almost double the power loss. He thought it important if reliable tests were to be made that they should be done under definite conditions. There must be either sinusoidal flux or sinusoidal H. Then different tests would give the same results. With the method employed in the paper he feared quite different results would be obtained with different circuits. With regard to the use of a calorimeter, he had gone in for a thermal wattmeter and although there were errors in this instrument one could get very good results provided one knew why the errors arose.

MR E. RAWLINSON (Metrovick) said that he used a permeameter of the Armour, King and Walley type extensively. One great timewaster was the establishment of uniform flux. Direct indication of lack of compensation was an admirable feature.

MR D. A. LANGFORD asked whether the temperature distribution after 4 seconds was virtually flat or approached parabolic form. If it was nearing parabolic condition, there might be considerable error in the absolute value.

The authors briefly replied.

**LIST OF EXHIBITORS**

| | Stand |
|---|---|
| AC-Delco (General Motors Ltd.) | 94 |
| Aerialite Ltd. | 147 |
| Agro Electrical Co., Ltd. | 90 |
| Aidas Electric Ltd. | 145 |
| Allen West and Co., Ltd. | 186 |
| A. and M. Electrical Services | 205 |
| Arrow Electric Switches Ltd. | 117 |
| Ashley Accessories Ltd. | 142 |
| A.S.E.E. | 29 |
| Astral Equipment Ltd. | 154 |
| Astral Switchgear Ltd. | 142 |
| Automatic Coil Winder | 67 |
| Backer Electric Co., Ltd. | 12 |
| Bakelite Ltd. | 151 |
| H. J. Baldwin and Co., Ltd. | 111 |
| Barlow-Whitney Ltd. | 122 |
| Bastian and Allen Ltd. | 101 |
| G. Becker Ltd. | 73 |
| Belmos Co., Ltd. | 209 |
| Benjamin Electric Ltd. | 211 |
| Best Products Ltd. | 173 |
| Bill Switchgear Ltd. | 143 |
| Black and Decker Ltd. | 98 |
| F. C. Blackwell and Co., Ltd. | 139 |
| Thos. Bolton and Sons Ltd. | 97 |
| S. O. Bowker Ltd. | 141 |
| Geo. Bray and Co., Ltd. | 76 |
| British Central Electrical Co., Ltd. | 200 |
| B.E.A. | 30 |
| British Electric Resistance Co., Ltd. | 168 |
| B.I.C.C. Ltd. | 109 |
| British Thomson-Houston Co., Ltd. | 71 |
| Britmac Electrical Co., Ltd. | 25 |
| Brook Motors Ltd. | 44 |
| Brookhirst Switchgear Ltd. | 58 |
| Brownings Electric Co., Ltd. | 95 |
| Brush Electrical Engineering Co., Ltd. | 70 |
| Bryce Electric Construction Co., Ltd. | 100 |
| Bulpitt and Sons Ltd. | 134 |
| Burgess Products Co., Ltd. | 214 |
| C.M.A. | 10 |
| Cantie Switches Ltd. | 58 |
| Cayson Electric Ltd. | 104 |
| Channel Conduits Ltd. | 3 |
| Chapman and Hall Ltd. | 14 |
| Chilton Electric Products Ltd. | 180 |
| Chloride Batteries Ltd. | 137 |
| Clang Ltd. | 121 |
| Clare Instrument Co. | 208 |
| E. K. Cole Ltd. | 113 |
| "Communications and Electronics" | 84 |
| Contactum Ltd. | 195A |
| Courtney Pope (Electrical) Ltd. | 212 |
| J. A. Crabtree and Co., Ltd. | 59 |
| Crompton Parkinson Ltd. | 110 |
| Davis Sheet Metal Engineering Co., Ltd. | 52 |
| Dawe Instruments Ltd. | 73 |
| Delta Technical Services Ltd. | 91 |
| G. P. Dennis Ltd. | 45 |
| "Diamond H" Switches Ltd. | 164 |
| Dimplex Ltd. | 43 |
| Donovan Electrical Co., Ltd. | 128 |
| Dorman and Smith Group | 199 |
| Dowding and Mills Ltd. | 175 |
| D. P. Battery Co., Ltd. | 65 |
| Dubilier Condenser Co. (1925) Ltd. | 150 |
| E.D.A. | 20 |
| E.R.A. | 22 |
| Edison Swan Electric Co., Ltd. | 69 |
| E. F. Electric Ltd. | 105 |
| Ekco-Ensign Electric Ltd. | 60 |
| Electrical Apparatus Co., Ltd. | 32 |
| E.A.W. | 7 |
| E.C.A. | 13 |
| E.L.B.A. | 6 |
| "Electrical Industries Export" | 8 |
| "Electrical Journal" | 39 |
| "Electrical and Radio Trading" | 4 |
| "Electrical Review" | 23 |
| "Electrical Times" | 49 |
| E.W.F. | 11 |
| Electric Construction Co., Ltd. | 197 |
| Electro Mechanical Manufacturing Ltd. | 75 |
| Elliott Bros. (London) Ltd. | 170 |
| George Ellison Ltd. | 124 |
| E.M.I. Electronics Ltd. | 206 |
| E.M.S. Electrical Products Ltd. | 132 |
| Enfield Cables Ltd. | 86 |
| Engel and Gibbs Ltd. | 21 |
| English Electric Co., Ltd. | 41 |
| English Electric Valve Co., Ltd. | 119 |
| Erskine, Heap and Co., Ltd. | 187 |
| Evershed and Vignoles Ltd. | 114 |
| Falk, Stadelmann and Co., Ltd. | 5 |
| Fenton, Byrn and Co., Ltd. | 155 |
| Ferguson Pailin Ltd. | 72 |
| Ferranti Ltd. | 87 |
| Fitzgibbon and Murray Ltd. | 63 |
| Foster Transformers Ltd. | 192 |
| Fractional H.P. Motors Ltd. | 136 |
| V. and E. Friedland Ltd. | 171 |
| General Electric Co., Ltd. | 160 |
| Gent and Co., Ltd. | 38 |
| Gillott Electro Appliances Ltd. | 193 |
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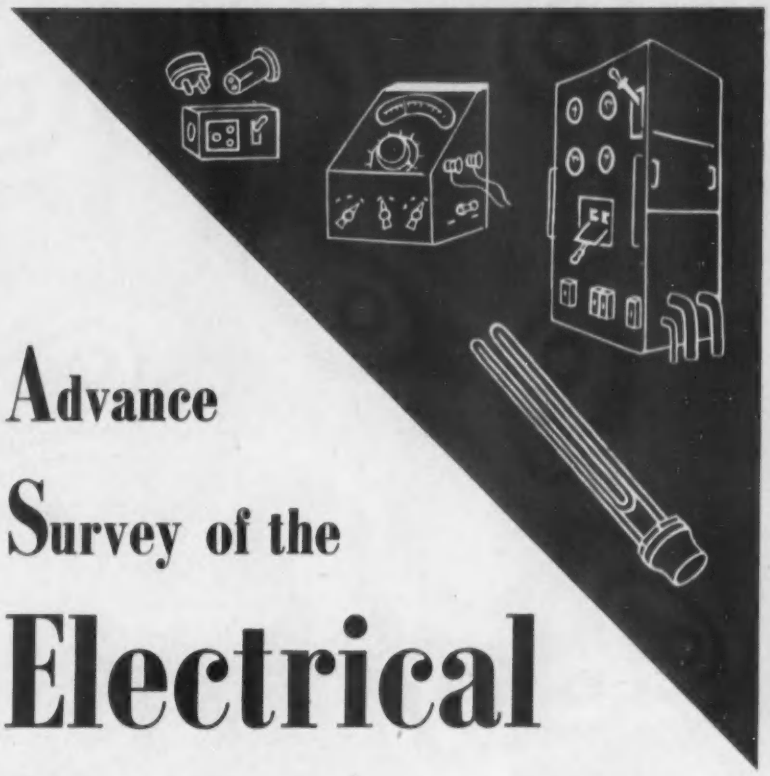

# Advance Survey of the Electrical Engineers EXHIBITION

**FOURTH ANNUAL DISPLAY STAGED AT LONDON'S EARLS COURT EXHIBITION CENTRE AFFORDS A FURTHER HOME AND EXPORT SHOP WINDOW FOR THE ELECTRICAL INDUSTRY**

**15—19 MARCH 1955**

*10 a.m.—7 p.m.*
*(Wed. until 9 p.m.)*

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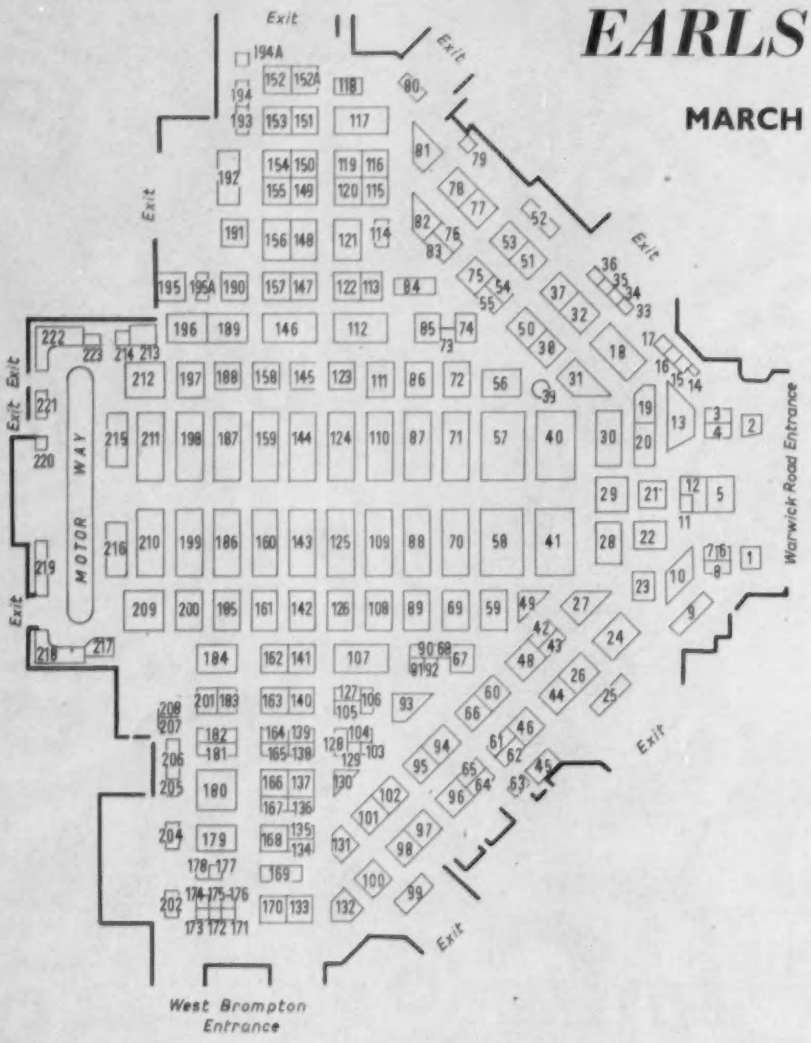



FOR those who, from its inception, have supported the Electrical Engineers' exhibition, there is undeniably room for pleasure in that at Earls Court, this year's show has surpassed previous electrical exhibitions, providing the biggest display of British electrical products ever assembled under one roof. A total area of 250,000 sq ft is occupied by over 240 exhibitors, a positive indication of the popularity this event now enjoys, and more than double its size two years ago.

As in previous years, the exhibition has a theme. On this occasion it is the electric motor, illustrated by the "Motor Way"—an avenue of machines from different manufacturers—and, dominating one end of the exhibition, a 30 ft model suspended 40 ft above the floor. By way of contrast, the wall at the far end of the hall is decorated by a scenic backcloth depicting the latest design of Britain's atomic power station, working in an animated form by using fluorescent lighting controlled by gasfilled valves.

Such is the setting against which Lord Citrine, chairman of the British Electricity Authority, will officially open the Exhibition at noon on Tuesday, March 15. From then, until its closing on Saturday, March 19th, it is open each day from 10 a.m. to 7 p.m., and for an extra two hours on Wednesday. What of the exhibition itself? Understandably, a heightened emphasis on electro-motive power is to be seen, which is also reflected in associated equipment. Motors apart, however, many manufacturers have chosen the exhibition as the appropriate time to launch new products, or modified versions of older items. On the other hand, well established lines are by no means kept in the background. Once again, competitions are being held for the best all round exhibit in both industrial and domestic equipment and, no doubt, adjudicating this year will prove no easier than on earlier occasions.

# COURT

## 15 - 19, 1955

# Review of Exhibits

**AC—Delco**

With electro-motive power the theme of this year's A.S.E.E. Exhibition, this stand has an attractive display of British made "Delco" motors attracting the attention of both manufacturers and users of motorised equipment and appliances and of maintenance engineers. Machines are available in capacitor start, split phase, universal and p.v., d.c. types together with rotor and stator units. No. 94.

**Aerialite Ltd.**

Of particular importance in the "Aerialite" range of cables and flexibles for industrial, domestic and mining installations are "Ashathene" cables to be seen here. Made in compliance with B.S.1557, they employ polythene core insulation with p.v.c. sheathing, and a display panel shows a typical selection of types. No. 147.

**Agro Electrical Co.**

A comprehensive display of bells, buzzers, and transformers, indicators and pushes for bell systems ranges from ironclad weatherproof units to bakelite accessories for domestic use. Another aspect of this firm's activities is seen in their "Bakelite" lighting accessories, which built to British Standard requirements wherever applicable, make for trouble-free installations. No. 90.

**Aidas Electric Ltd.**

Last year's winner of the domestic award—the "Sadia Select" 3 gall. electric storage water heater—is again prominently displayed, backed up by other units from 1½ to 30 galls in capacity. Of larger sizes, there is the 60 gallon unit, type KS, which, having a heater rating of 9 kW, is eminently suitable for use in schools, canteens and the like. No. 145.

**Allen West and Co.**

For the motor user and designer, Allen West offer, we understand, a variety of motor control gear of both automatic and manual operation, among which is a new contactor pattern direct switching starter with plug-in design interior unit. No. 186.

**Alorite Ltd.**

A member of the Dorman Smith group, this firm's output is confined solely to "Alorite," a new ceramic used for compounding latex, and grinding pigments, fine chemicals and the like. Stated to have a hardness surpassed only by the diamond, it exhibits high resistance to both mechanical and thermal shock and corrosive materials and is neither conducting nor magnetic. No. 199.

**Arrow Electric Switches Ltd.**

For the motor control gear designer, Arrow display their complete range of magnetic contactors, which are stated to incorporate new design features effecting a 50% space saving over conventional types. Hood and base are moulded in "Plascon-Alkyd" having enhanced surface resistivity. Units are offered in 30A, 50A and 100A sizes. No. 117.

**A. and M. Electrical Services**

Specialists in armature and rotor winding, this firm, we learn, is displaying exhibits indicating the repair and converting work catered for. No. 205.

**Ashley Accessories Ltd.**

Among several products on show for the first time is the "Ashley" selective entry spur junction box, for making spur connections in domestic ring main circuits and capable of taking twin core t.r.s. cable with e.c.c. up to 7/·044. Another newcomer is their fused 13A socket adapter accepting two 13A fused plugs. No. 142.

**Astral Equipment Ltd.**

The two well-known Astral refrigerators form the centre of this display, the table model, measuring only 26 in. by 20½ in. by 21¼ in., being particularly suited to the small space available in modern households. Of the absorption type, it is stated to consume only 1·5 units/day for its 1·5 cu ft of storage space. No. 154.

**Astral Switchgear Ltd.**

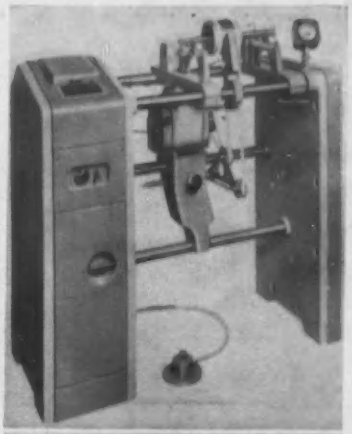
This member of the "Ashley" group shows, for the contracting engineer, a useful selection of l.v. distribution equipment. On their first time showing are fused-switches, made in three ratings of 60A, 160A, and 300A, at 660V, and employing B.S.88, h.r.c. fuses. No. 142.

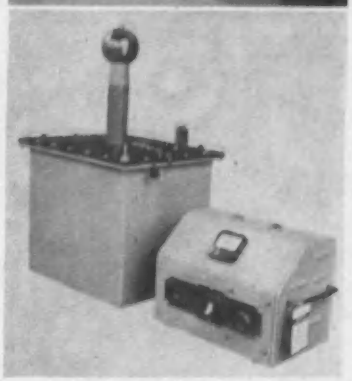
**Aut. Coil Winder and El. Equip. Co.**

Although the fundamental conception of the "Avometer" has changed little since its introduction in 1923, the range of models on show indicate the special modifications made to cater for individual branches of the industry. The Braille model is a good example, appealing to all managements concerned with the employment of the blind, whilst the power engineer will find models 7 and 40, in conjunction with the p.f. and wattage unit, of particular interest. No. 67.

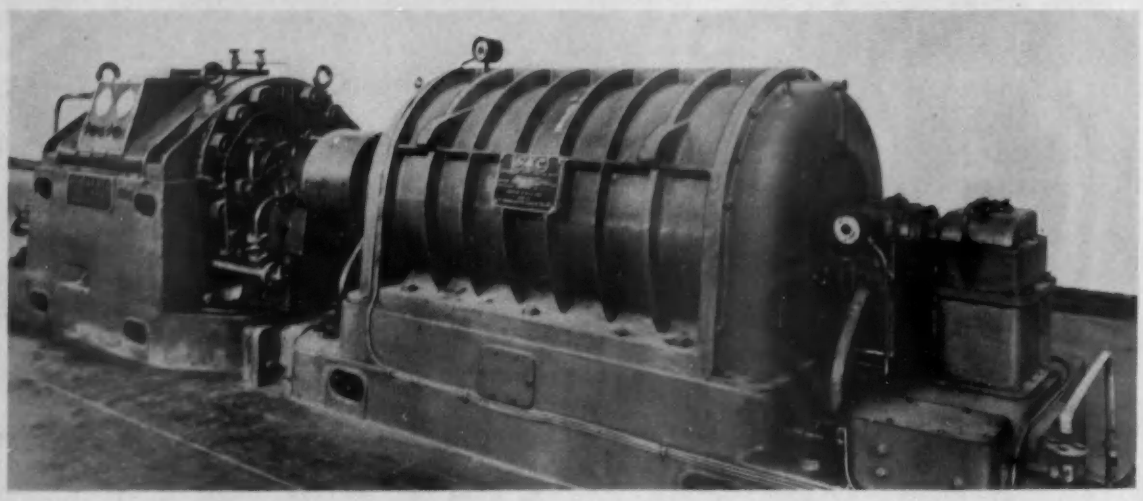
**Backer Electric Co.**

Featured in this display are complete appliances loaned for the occasion, illustrating the variety of applications requiring clean, safe heat for which the "Backer" heating elements have been utilised. Here are seen the latest equipment and novel applications of considerable interest to the designer of appliances involving electric heating. No. 12.





*From top to bottom are shown the E.M.I. dynamic balancing machine, Crabtree's A.15 reversing automatic star-delta starter, the "Minunit" switchboard by Cantie, and Foster's 100 kV pressure testing transformer*



*One of the "Motor Way" exhibits, this is the G.E.C. 1,550 h.p., 3·3 kV, 2,950 r.p.m. squirrel cage motor driving a boiler feed pump for installation at Uskmouth Power Station*

**Bakelite Ltd.**

Serving the insulation needs of the industry is a wide variety of plastic materials, many of which possess enhanced corrosion and mechanical properties permitting their use for heavy duty in exposed conditions. Examples of laminated sheet rod and tube on show include new high pressure glass laminates based upon melamine, silicone and phenolic resins. No. 151.

**H. J. Baldwin and Co.**

From this company's Mains Equipment Division come a representative selection of cable protection covers, stoneware conduits and precast concrete products for use in the Supply Industry, together with examples of transmission line steel work. For appliance manufacturers are the "Wireohms" heating elements. No. 111.

**Barlow-Whitney Ltd.**

New products to be shown by this firm include a rotary tube furnace, hopper fed, designed to give reliable service in heat treating mass produced ferrous or non-ferrous components. Capable of being incorporated into mass production methods, it incorporates a variable speed unit giving a wide variation of output. No. 122.

**Bastian and Allen Ltd.**

Specialists in electric steam heating will find much of interest on this stand, notable exhibits being two totally enclosed automatic packaged electrode steam boilers. One is the "Stanmore" unit and is shown in operation, the steam being used in an all-glass heat exchanger. The other, their "Autolec" unit incorporates a load control relay to adjust the load in steps of 10%. No. 101.

**Geo. Becker Ltd.**

To be seen in this comprehensive display of wiring accessories are new 5A and 15A socket-outlets with porcelain bases in both flush and surface mounting types, the former being designed to fit B.S.1299 boxes. New "Bakelite" finger-shield plugs in 2A and 5A sizes are also being displayed. No. 73.

**Belmos Co.**

Latest developments in the "Belmos" range of industrial and flameproof m.v. switch and control gear include a five-tier starter housing for switchboards, a large multi-contactor starter unit, and a contactor unit for use with p.f. correction capacitors. Of particular note are flush fronted industrial starter boards. No. 209.

**Benjamin Electric Ltd.**

For industrial lighting engineers, Benjamin offer a number of developments. Here can be seen a modified version of the "Duoflux" floodlighting fitting equipped with raising and lowering gear to facilitate maintenance. An expanded range of "Flurolier" fittings is displayed, units being arranged with continuous channelling to demonstrate the firm's system. No. 211.

**Best Products Ltd.**

Much attention here will probably be devoted to Best's elegant "Fanfare" safety alarm electric kettle. Instead of the high-pitched note of most whistlers, it emits, when boiling, a loud, organ-toned chord imparted by a four-reed plate in the spout cover. No. 173.

**Bill Switchgear Ltd.**

On show for the first time is the "Civic" consumer unit providing a compact method of protecting and controlling domestic a.c. installations. It is available with four, six and eight fuse ways, fitted with any combination of 5A, 15A and 30A fuses. To bridge the gap between these units and their heavy duty industrial panels, they also offer "Britannia" unit construction panels. No. 143.

**Black and Decker Ltd.**

Portable tools for a multitude of uses form a display for the maintenance or works engineer. Here are exhibited portable drills from ¼ in. to 1 in. capacity, grinders, saws for metal, wood and ceramics, and heavy duty sanders. The range includes a full complement of accessories. No. 98.

**F. C. Blackwell and Co.**

In this display of "Blaco" pressed steel conduit fittings are seen recent introductions in their range of plaster depth switch boxes, with both traditional and B.S. 1299 switch fixing. For ring main wiring there are switch and socket boxes complying with B.S. 1299 and 1363 whilst copper junction boxes indicate their activities in making accessories for copper sheathed cable installations. No. 139.

**Thomas Bolton and Sons**

Among this diversity of copper products, particular interest is centred in their "Combarloy," h.c. copper and chromium commutator segments, in view of the theme of the exhibition. All sizes and sections are available either blank, sawn or stamped to shape, whilst examples of stepped and special sections can also be seen. No. 97.

**S. O. Bowker Ltd.**

Here the domestic installation specialist, whether wireman or designer, can view the entire range of "Tenby" accessories which include junction boxes, wiring clips, and all types of switches. For modern installations, their plaster depth fittings, arranged to ensure correct adjustment of the fitting to the plaster surface, is of particular interest. No. 141.

**Geo. Bray and Co.**

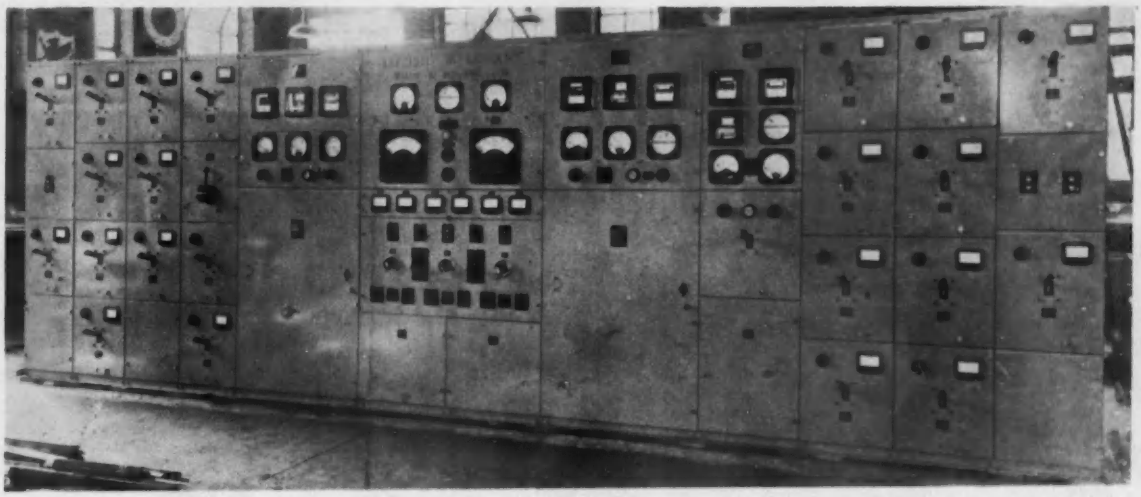
The electrical division of this firm is well represented by their display of heating elements. Of the refractory embedded, metal sheathed type, these are available in strip, ring, pad, cartridge and sheathed-wire form, and are eminently suitable for both industrial and domestic use. No. 76.

**British Central Elect. Co.**

Particular attention is given by this firm of electrical wholesalers to their "Visiport" unit designed for storing and displaying small components. Another feature is a display of aluminium soldering. No. 200.

**British Elect. Resistance Co.**

Prominent in the "Berco" display of industrial type resistors, rheostats, transformers, variable ratio transformers and voltage stabilising equipment is a recently introduced series of power rheostats and potentiometers. Known as "Bercostats," they are available in 6 sizes from 25 to 30 W rating. No. 168.



*A marine type a.c. switchboard by Whipp and Bourne, which, suitable for 440 V, three-phase, 60 c/s systems, employs circuit-breakers up to 900 A*

**B.I.C.C. Ltd.**

In a display primarily designed to attract the distribution and installation engineer, B.I.C.C. show mass-impregnated, non-draining paper insulated cables for use at up to 11 kV, rubber and thermoplastic cables and cords for power and lighting circuits, to name but two examples in this field. The display is supported by a variety of cable accessories and other industrial products. No. 109.

**British Klockner Switchgear Ltd.**

This member of the Dorman Smith group feature a variety of versatile motor starters and other control gear, the former including direct on line push-button operated units for controlling s.c. motors from ½ to 7·5 h.p., and supplied in either air-brake or oil-immersed designs. No. 199.

**British Power Transformer Co.**

To be seen with its associated company on the "Berco" stand, B.P.T. feature a series of pole mounting transformers for rural distribution, together with automatic voltage stabilisers employing the industrial type "Regavolt" variable transformer and made in ratings up to 70 kVA, 3-phase. No. 168.

**British Thomson-Houston Co.**

Many of the B.T.H. activities at Rugby are represented on this stand, a particular item likely to attract considerable attention being the three-phase automatic circuit recloser for improving supply continuity on rural distribution lines, preventing transient faults from causing lengthy interruptions. "Mazda" exhibits feature a shop window lighted by recessed, louvred fluorescent fittings supplemented by "Cupola" adjustable reflector spotlighting units. No. 71.

**Britmac Electrical**

Wiring accessories are so commonplace in nature that it is sometimes surprising, on viewing a comprehensive range such as this, to note the special models developed. A particular example are their "hinged flap" socket outlets, in which the outlets themselves are normally covered. No. 25.

**Brook Motors Ltd.**

Featured in this display of motors are machines built to B.S. 2083, of which fan cooled types are available in frame sizes B.18E to B.365. As an alternative Brook now offer an open, drip-proof machine at standard output and sizes for frames 203 to 326. A prototype of the new design in the drip-proof range is shown, it having an improved endshield stated to give greater efficiency of ventilation. No. 44.

**Brookhirst Switchgear Ltd.**

As one of the three firms in the Electrical Division of Metal Industries Ltd., Brookhirst display an extensive range of motor control gear, a novel unit being a straight-on starter with plug-in interior to facilitate rapid replacement under fault conditions. This unit is suitable for up to 7½ h.p., 400/44 V and can be arranged for local or remote control. No. 58.

**Browning's Electric Co.**

Notable in this display of commutators, slip-rings and associated products is a new commutator turning and undercutting machine. Novel in design, it is claimed to reduce the time and increase the accuracy of these operations. No. 95.

**Brush Electrical Eng. Co.**

For the switchgear enthusiast, here are shown two examples of Brush air insulated, vertical isolation, horizontal drawout gear, both incorporating plain break bulk oil content c.b.'s. One unit is of the single busbar type, rated at 400 A, and 250 MVA at 11 kV, and demonstrating the neat appearance obtained with a flush front door. The second example is designed to incorporate duplicate busbars, and employs a 1,200 A c.b. No. 70.

**Bryce Electric Construction Co.**

The importance of power factor correction cannot be over-emphasised, and here the works engineer can inspect a variety of units for industrial use. A tank type capacitor, moreover, is shown fitted with a contactor, "Perspex" inspection panels enabling constructional details to be examined. No. 100.

**Bulpitt and Sons**

Newcomers to the exhibition, this firm shows, representing their domestic appliances, examples of the "Swan Brand" range, including special immersion elements for domestic and industrial applications. Their sister firm, B.K.B. Electric Motors Ltd., display, in the "Birmingham" range, not only standard a.c. and d.c. machines but special types which can be made to suit individual requirements, whilst the "Luton" range indicate the variety of f.h.p. units available. No. 134.

**Burgess Products Co.**

From the Micro-Switch Division of the company is exhibited a new switch which is not only aimed at providing the usual protection against accidents to operators of cubicle type, h.v. equipment but also affords a rapid method of maintaining the equipment operative should service engineers require it open. No. 214.

**Cantie Switches Ltd.**

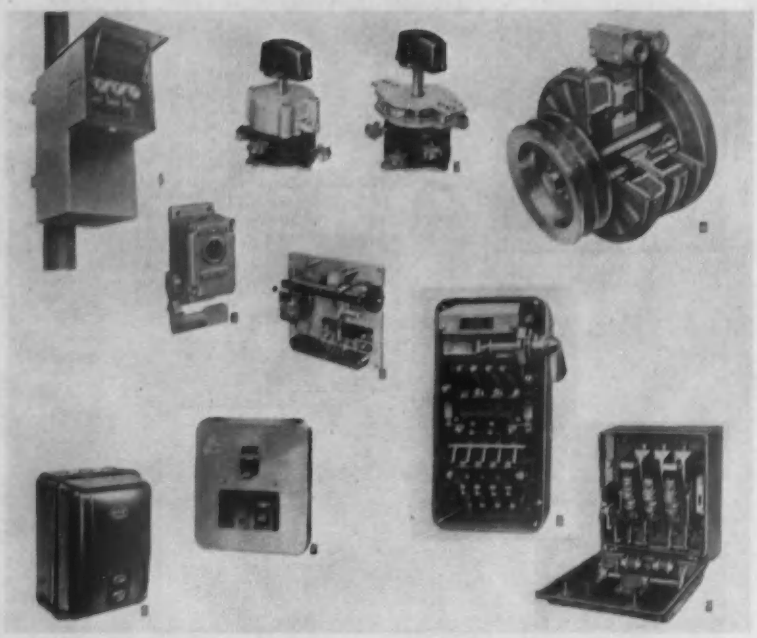
For engineers preferring centralised control of electrical drives, heating, lighting and other plant, this member of the Metal Industries group exhibits its "Minunit" cubicle switchboard as the principal feature. Although such boards are built to customers' requirements, the unit shown indicates the standard nature of its component switches, circuit-breakers and other units and the facilities afforded for maintenance. No. 58.

**Cayson Electric Ltd.**

On this stand, we understand, a range of transformers is being shown, including open and enclosed versions, both air and oil insulated and l.v. units, together with metal rectifier equipment and fluorescent lighting control gear. No. 104.

**Channel Conduits Ltd.**

Taking pride of place in this exhibit is the firm's standard range of spring capped, cable trunking, complete with accessories, which should appeal to engineers concerned with cutting installation costs. New to their activities is an overfloor cable duct system, which known as the "Pancake," is designed for use in offices and showrooms. No. 5.



*Here are seen, 1, a pole mounting l.v. outdoor p.f. correction capacitor by Dubilier. 2, a recent Donovan development of a light pattern, foot operated switch. 3, "Diamond H" a.c. only packet switches for motor control. 4, the Warner electric clutch and brake, shown by Westool. 5, a Londex, type HSC calibrated relay. 6, M.E.M.'s stylish "Autoline" starter. 8, interior view of the new E.A.C., MF2L direct switching starter with isolator and 9, Astral Switchgear's new 60A switch fuse*

**Chilton Electric Products Ltd.**

Here the specialist concerned with the protection of l.v. distribution sub-circuits will find much of appeal in the "Atlas" miniature h.r.c., c.b.'s and "Chilton" voltage operated e.l.c.b.'s, which are demonstrated to show operation in typical domestic and industrial applications. For comprehensive protection there is, too, their current balance and voltage operated e.l.c.b. No. 180.

**Clang Ltd.**

Here for the installation engineer is a full range, numbering somewhere over 300, of electrical accessories, of which their dimmer switch merits inspection. For outdoor installations they show a useful selection of weatherproof plugs and sockets. No. 121.

**Clare Instrument Co.**

Industrial test gear is featured in this display, exhibits ranging from insulation testers and ohmmeters to a new direct reading thermometer bridge for rapidly determining the temperature rise of copper conductors and the like. Versatile in operation, it can also be used as either a Wheatstone or limit bridge, with a per cent deviation scale. No. 208.

**E. K. Cole Ltd.**

A principal exhibit takes the form of new flameproof "Thermotubes," which, carrying the Ministry of Fuel's certification for Group II gases and complying with B.S. 229, are designed for use in such hazardous areas as cellulose paint shops, petrol and oil stores, and grain warehouses. Available in lengths of 2 to 15 ft, their loading ranges from 30 to 60 W. No. 113.

**Chloride Batteries Ltd.**

Battery operated equipment for all industrial applications is featured with a representative selection of "Chloride" stationary cells. Typical of a wide range of emergency lighting sets for industry, cinemas, shops, hotels and all public buildings is a complete automatic "Keepalite" equipment. No. 136.

**Contactum Ltd.**

Making its debut at the exhibition is a novel design of a.c. shuttered switch socket-outlet, available in 2, 5 and 15 A sizes, and fitting B.S. 1299 boxes. Another newcomer is a twin gang 13 A shuttered socket-outlet, whilst other accessories include one- and two-way flush and surface switches for a.c. circuits, including a twin unit fitting inside a single size B.S. 1299 box. No. 195A.

**Courtney, Pope (Electrical) Ltd.**

Newcomer to this range of attractive commercial fluorescent lighting fittings is their series C 164 pendant fitting, which, employing four 5 ft 80 W lamps together with two 2 ft 40 W lamps at each end, is ideally suited for lighting ground floor office halls and the like. No. 212.

**J. A. Crabtree and Co.**

Another firm choosing the exhibition to introduce new lines is Crabtree, who feature a selection of limit switches available with various forms of operating head, and include patterns for either snap or slow action. Of well established lines, equipment of particular note is their motor starter gear, comprising the A-15, oil break, and B-15 air break units together with the D-6 hand operated starter for f.h.p. motors. No. 59.

**Crompton Parkinson Ltd.**

In view of this year's theme for the exhibition, it is not surprising that Crompton's give special attention to motors, with their type NK, totally enclosed, fan cooled machines being featured. Ranging from 60 to 800 h.p., they can be offered in a variety of starting characteristics, whilst a double air-cooling system provided for all totally enclosed moving parts makes for efficient ventilation. No. 110.

**Davis Sheet Metal Eng. Co.**

For the economy minded installation engineer, Davis offer their cable trunking, with "Quick-Fix" covers together with a comprehensive range of accessories. Both under-floor and flush mounting types of trunking are available whilst the "Tap Trunking" is particularly suitable for feeder distribution. In this system, boxes may be erected at any position along the trunking and power tapped from the main v.r.i. conductors by means of special line taps. No. 52.

**Dawe Instruments Ltd.**

Selecting one of the range of electronic instruments on show here, the moisture in timber meter is offered as a versatile instrument for engineers concerned with storing wood in quantity. With the use of probes the meter indicates the moisture content of timber during storage or after fabrication, providing a sure guide of its condition. No. 73.

**Delta Technical Services Ltd.**

Manufacturers of pressure, vacuum and flow operated switches for industrial, electronic and general factory application, this firm show among a representative range of products, a particularly interesting unit in their M1/M4, air flow failure device. Of the electrical, gravity loaded, metal diaphragm type, it is eminently suited for oil or gas fired furnaces or drying or enamelling plant. No. 91.

**G. P. Dennis Ltd.**

Modern design is well in evidence in the new range of "Hi-Style" fuseboards, which present a streamlined appearance without lugs or other projecting features. Concealed hinges are incorporated, whilst a slam lock replaces more conventional screw fittings. No. 45

**"Diamond H" Switches Ltd.**

Apart from a comprehensive range of a.c. only and a.c./d.c. rotary reciprocating heater switches for use on domestic appliances, there is of special interest to cooker designers a series of thermostats recently designed and incorporating front of panel calibration; positive mechanical indexing, plug-in neon pilot lighting and a special magnetic control device. The new, three-stage, pre-heat, bake and grill instrument will be shown. No. 164.

**Dimplex Ltd.**

For those who prefer low surface temperature heating here is displayed an attractive display of oil-filled electric radiators which combine convenience with safety for the home. No. 43.

**Donovan Electrical Co.**

For the motor control gear designer, the Donovan exhibit includes a.c. direct-switching starters up to 75 h.p., available in both standard and reversing patterns, in various sizes and types, together with a variety of limit switches, foot switches, float switches and other control devices.

In their range of distribution equipment are seen heavy duty "Donlok," "Safuse" and "Scrutact" ironclad switch and fuse gear and "Runtact" enclosed overhead busbar ducting with movable contact trolley. No. 128.

**Dorman and Smith Ltd.**

Saving in labour costs is an important installation consideration, and here the contracting engineer can view the Dorman system of switchboard construction, recently described in the ELECTRICAL TIMES. Other switchgear exhibits include the T.S. fused switch, available now in up to 300 A rating, whilst the 500 V "Flowline" distribution boards are a good example of modern design. No. 199.

**Dowding and Mills Ltd.**

Specialists in electrical repairs, this firm features a display of partly wound motor stators showing methods and materials employed. Equipment used in their metal spray process of reclaiming worn parts is also exhibited. No. 175.

**D.P. Battery Co.**

A 10,000 Ah capacity D.P. stationary cell assembled in a lead-lined wooden box dominates the display. The largest of a comprehensive group of open and sealed-in types, it is typical of many supplied to generating stations and telephone exchanges all over the world. Smaller cells, used extensively for such duties as emergency lighting, switch tripping and closing, railway signalling, country house lighting and radio transmission, are also available. No. 65.

**D.S. Plugs Ltd.**

Another member of the Dorman and Smith group, the firm of accessory manufacturers feature their 13 A fused plugs and outlets, claimed to be the simplest type made. It incorporates a hinged pin to facilitate fuse changing. No. 199.

**Dubilier Condenser Co.**

Where p.f. correction on distribution systems is to be considered, Dubilier show a variety of suitable capacitors, including pole mounting types, and fitted with automatic control equipment. At the other end of their range are mains suppressor plugs, likely to prove worthy of attention in view of recent regulations concerned with radio interference suppression. No. 150.

**Edison Swan Electric Co.**

Featured on the Ediswan stand is their new shallow trunking for all types of lighting fittings and light duty power operated machinery. By virtue of its shallowness, it is stated to be suitable for use in offices and stores, yet sufficient space is available for wiring for both lighting and other equipment. Suspension of the trunking may be effected by either chain or conduit. No. 69.

**E.F. Electric Ltd.**

For both workmanship and design, this firm's range of wiring accessories merits attention. Outlets are available in all sizes from 2 to 15 A, either switched or unswitched and for flush or surface mounting, and require the minimum types of steel boxes. No. 105.

**Ekco-Ensign Electric Ltd.**

This comprehensive display of lighting fittings emphasises fluorescent units for industrial, commercial and decorative purposes. A prominent feature is a new slim batten fitting, for a single 5 ft, 80 W tube, and employing h.p.f. switchstart control gear tapped 200 to 250 V, 50 c/s. Simple to install it presents little difficulty in cleaning and is finished in high gloss white stove enamel. No. 60.

**Electric Construction Co.**

Equal emphasis is given to each section of the company's products, exhibits ranging from motors in each of the B.S.2083 frame sizes, up to 25 h.p. to a display of m.c. and m.i. instruments. A Ward-Leonard package type drive, prepared for hosiery machine applications, illustrates the wide range of rapid speed control obtainable, the unit being demonstrated complete with d.c. motor and brake. No. 197.

**Electrical Apparatus Co.**

Among new features here are seen a series of direct-on, push button starters for motors up to 7½ h.p. in size, the ranges including the "Autette" and MF2 autoswitches. Cubicle type panels, fully automatic in operation, are also displayed, together with d.c. air-break and oil immersed equipment and a.c. contactor units for starters of all types. No. 32.

**Electrical Times**

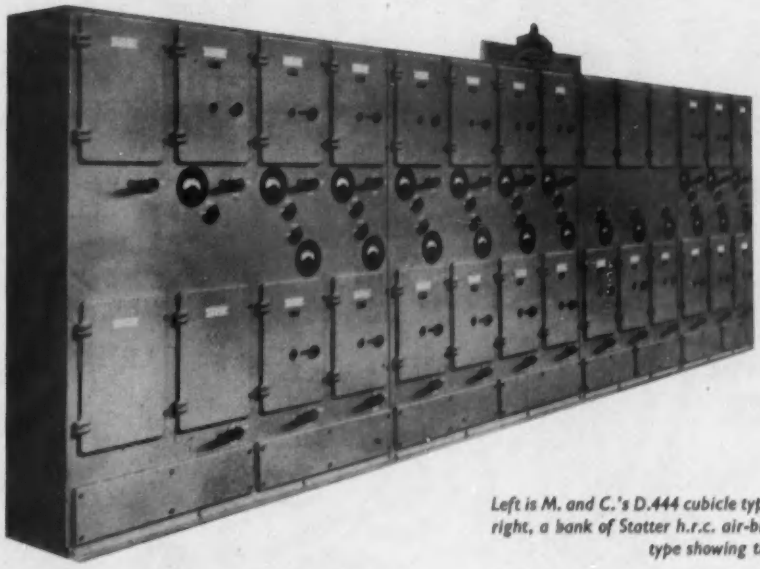
Our stand, this year, features the international service we provide reflecting both the information of overseas events and progress published for home readers and the editorial and advertising services for overseas assimilation. Against this background, qualified technical editorial staff will be in attendance to assist visitors, whilst our enquiry service is also available from the stand. No. 49.

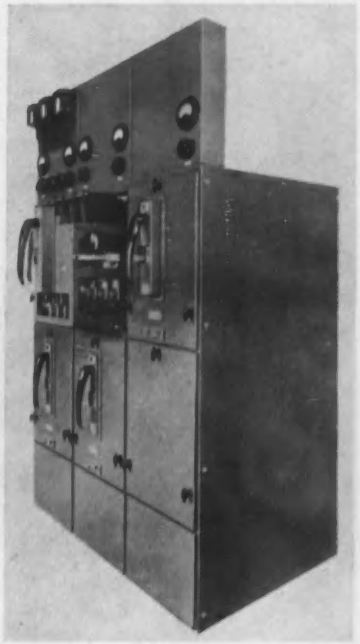
**Electro Mechanical Mfg. Co.**

For motor control specialists, this firm's cubicle control boards, embracing contactor starters and switch and switch fuse gear, merit attention. All control gear is mounted on the door, which can be thus completely removed for maintenance, whilst all live metal in the cubicle is screened against accidental contact. Moreover, spare compartments are also connected to the busbars, enabling additional doors and control gear to be immediately connected in circuit. No. 75.

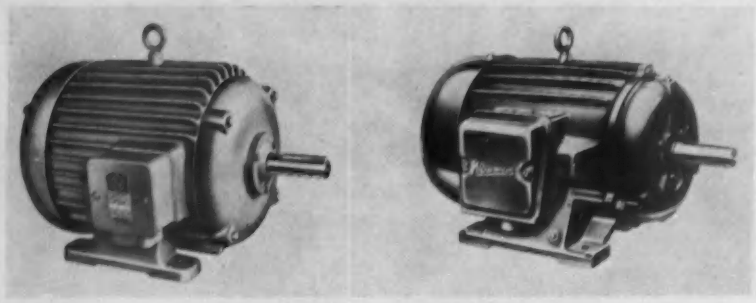
**Elliott Bros. (London) Ltd.**

Specially featured on this stand is a complete range of precision instruments for standards room and test station. A notable exhibit is the high stability power frequency generator for test laboratory supplies, providing, in conjunction with good standards, means for a.c. testing comparable with d.c. at frequencies between 40 and 2,500 c/s. A new introduction is their hermetically sealed moving coil relay, capable of operating on as little as 10 microwatts. No. 170.





*Left is M. and C.'s D.444 cubicle type motor control and distribution gear, and above, right, a bank of Statter h.r.c. air-break circuit-breakers of the horizontal draw-out type showing the positions of the breakers*



*Far left, the new surface cooled machine by Small Electric Motors shown here with Newman's totally enclosed, fan cooled motor to B.S. 2083*

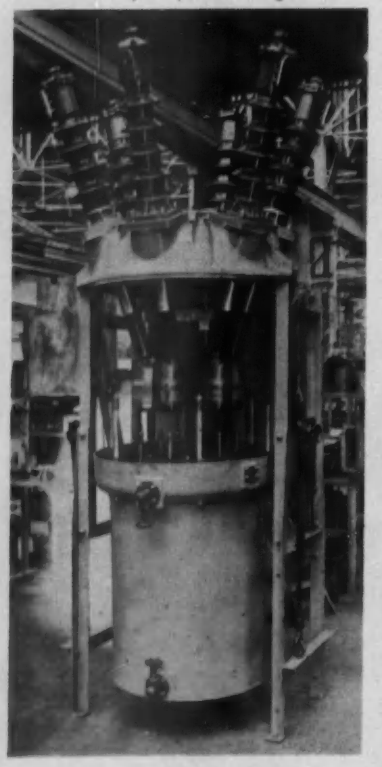
**Geo. Ellison Ltd.**

Described recently in our feature, "Equipment for Industry," the "Ellison" oil-break c.b. and direct on-line motor starter is a prominent exhibit. Having a A.S.T.A. tested rupturing capacity of 1·5 MVA at 600 V, it is rated at 20 A at up to 660 V. Also likely to create interest are modifications to their oil cooled rotor starter for slip-ring induction motors No. 124.

**E.M.I. Electronics Ltd.**

On show for the first time are three new models of stroboscopic balancing machines, capable of dealing with rotors up to 24 in. dia. and 150 lb in weight. All console models, built on a heavy cast framework to withstand hard treatment, the machines are designed to measure out of balance forces producing displacements as small as 0·000025 in. No. 206.

*Metrovick's type LG1, 33 kV, 750 MVA, oil circuit-breaker with tank lowered by means of two "pull-lifts" and slings*



**E.M.S. Electrical Products Ltd.**

Installation specialists will be attracted by this display of "Trolley Duct" and "Unidact" feed rail systems for single and 3-phase distribution. Also on show is the "Minibus" miniature busbar distribution system with which is displayed a pre-production model of this system in the four bar type. No. 132.

**Enfield Cables Ltd.**

Few engineers would find their special field of cables not covered by this exhaustive display, ranging from compression cable suitable for use up to 275 kV to multi core types for signalling and telephone use. Of particular interest in the field of factory lighting is the "Enfield" grid suspension system, now available with lighting fittings designed specifically for use with it. No. 86.

**Engel and Gibbs Ltd.**

Three ranges of mercury relays and contactors are shown this year, comprising their basic contactor unit, now supplemented by medium and heavy duty designs. To this display are added automatic diesel control panels of the "on demand" and "remote control" types together with a variety of relays. No. 21.

**English Electric Co.**

A new 3-phase f.h.p. motor protection device, giving complete fault protection, is featured for the first time. Another interesting exhibit is an electrically-operated linear actuator for the remote control of boiler dampers. An imposing display of switchgear and fusegear includes "Superform" fuseboards and isolators, substation equipment, overhead busbar equipment, fuse links and cartridge fuses. No. 41.

**English Electric Valve Co.**

Occupying pride of place in this exhibit are valves specially designed and built for the more arduous conditions involved in the use of r.f. heating equipment. Available for either forced air or water cooling, these valves claim rugged construction, long life and overload capacity, making them ideally suited for this type of work. No. 119.

**Erskine Heap and Co.**

Examples of the Erskine range of switch and motor control gear include switchgear having an A.S.T.A. tested rupturing capacity of 250 MVA at 11 kV, and incorporating their "direct blast" arc control device. Low tension switchgear merits attention for the special contact layout employed. No. 187.

**Evershed and Vignoles Ltd.**

Here are seen all versions of the "Megger" insulation tests, the maid-of-all-work of the test engineer. A new feature this year is seen in modifications to Series 1 and 2 instruments, enabling them to be operated from mains supply for routine tests likely to be of long duration. No. 114.

**Falk, Stadelmann and Co.**

Although the emphasis here is given to industrial lighting fittings, much attention will be given to their contemporary design fitting recently awarded a place of honour in an International Competition. Notable among the other exhibits is the "Imperial" high bay unit for use in corrosive atmospheres. No. 5.

**Fenton, Byrn and Co.**

For the engineer primarily concerned with ventilation and heating, here are to be seen a useful selection of propeller type fans and convector heaters, of which over 20 units will be working. Manufactured to comply with British Standards where relevant, each unit exhibits a characteristic standard of design and efficiency. No. 155.

**Ferguson Pailin Ltd.**

Switchgear enthusiasts will find a representative display of equipment; high voltage engineers being catered for by the electro-hydraulic operating mechanisms designed primarily for operating isolators on the 275 kV supergrid. Distribution is represented by their 11 kV, 250 MVA ring main equipment. No. 72.

**Ferranti Ltd.**

Probably most attention will devolve around the "Fridge-Heater," stated to be the first heat pump of this design and application to be marketed. Compact in size, it gives a constant supply of hot water whilst keeping the larder air cool clean and dry. No. 87.

**Fitzgibbon and Murray**

For the installation engineer is staged this display of "Ewell" and "Jeani" accessories, including switch lampholders, flexible cord connectors, switch plates and bell pushes, to name but a few. Supplementing this display are examples showing their capabilities for machining insulating material. No. 63.

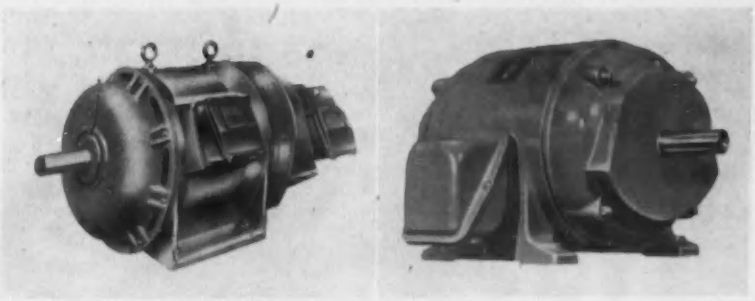
**Foster Transformers Ltd.**

As an exhibition within an exhibition, Fosters have here their mobile exhibition vehicle, which, described recently in the ELECTRICAL TIMES, is designed to display the full range of products anywhere in the U.K. or overseas. Supplementing the display of equipment in the vehicle are examples of their products on the Lancashire Dynamo Group Stand. Nos. 57 and 192.

**Fractional H.P. Motors Ltd.**

Of this display of a.c./d.c., universal, shunt, split-phase, three-phase, capacitor and shaded pole motors, ranging from 1/250 h.p. to ¼ h.p., two units are particularly noteworthy, their types D91 and C.70 geared units. The former has a standard speed range of 0·73 r.p.m. to 2·66 r.p.m. with output torques up to 850 lb in., whilst the latter gives torque up to 250 lb in. at speeds from 0·125 to 12 r.p.m. No. 136.

*On the far right is Brook's standard motor with a drip proof enclosure, together with a Crompton "NK" totally enclosed, fan cooled induction motor*



### V. and E. Friedland Ltd.

Attractive styling is one of the features of this display of bell and chime equipment of which but one example is "Warbler" chime giving a "repeating" chord for the front door, a double note for the back door, and a single note for a third door or internal call. No. 171.

### General Electric Co.

A feature of "Motor Way" is the G.E.C. 1,500 h.p., 3·3 kV, 2,950 r.p.m. squirrel cage coiler feed pump for power station use, and designed to operate with limited slip for a given time at 70% rated voltage, and constructed to run as quietly as possible. On the stand, seven general purpose industrial motors are displayed, including a double reduction geared unit for a B.R. 350 h.p. diesel electric shunting locomotive, and backed up by switch and starter gear in several types. No 160.

### Gent and Co.

Among the many products exhibited by this firm of electrical and horological engineers is a mains failure alarm suitable for use to give warnings of supply failure for protecting vulnerable processes, materials, livestock and agricultural and horticultural products. No. 38.

### Gil'ott Electro Appliances Ltd.

Demonstrating the efficacy of electric heating is the versatile "Cotswold" fan heater, capable of providing hot or cool air. A feature is the movable chassis which enables the heater to be either wall mounted or standing. Rated at 1.500 W and available for 200/220 or 230/250 V supplies, it employs a shaded pole motor and elements operate at black heat. No. 193.

### Griffiths Bros. and Co.

Examples of electrical insulating varnishes and compounds for all forms of metal protection are shown, special reference being made to the "Armasine" series of deep curing thermo setting impregnants. Also displayed are "Pakyderm" finishing varnishes and "Armacell 220" modified synthetic resin varnish. No. 116.

### Gulf Oil (Gt. Britain) Ltd.

In this display of oils designed for use in the electrical industry, application varies in diversity from their "Gulfoil" transformer and switch oils to time lag dashpot oils, and covering a variety of lubricating media. Examples of oil removed from service indicate the standard attained by Gulf Oil products. No. 27.

### G.W.B. Furnaces Ltd.

Special emphasis is laid on their range of contactors introduced on a large scale on to the British market last year. The main feature is the sintered tungsten-silver contact face which is fitted exclusively throughout the whole range from 10 A to 1,400 A a.c. and d.c. This type of face is stated to give a contact life several times longer than that of conventional copper contacts. No. 138.

### Harris and Sheldon (Electrical) Ltd.

Displayed here for engineers is a representative selection of "Handolite" lighting equipment for industrial, commercial and decorative application, together with an illuminated ceiling. No. 118.

### L. G. Hawkins and Co.

With its considerable "eye-appeal," Hawkins' latest addition—the "Marilyn" electric fire—is well named, and is to the forefront of their display of appliances. Available in standard colours of mushroom, cream or silver, it has a loading of 1.000 W and like its near relation, the "Pixie," it is designed to stand on the floor or hang on the wall equally readily. No. 80.

### Heatovent Electric Ltd.

This Scottish firm of heating appliance manufacturers exhibit equipment ranging from fan heater units to flameproof and dustproof heaters. A particularly attractive apoliance is their domestic convector unit, which is finished in a veneer and several choices of wood are available. No. 55.

### Hedin Ltd.

Another firm of electro-heating engineers whose products display the efficiency and versatility of electrical heating, give emphasis, in their range of band, strip, cartridge and woven elements, to industrial appliances. Ovens on show comprise a small laboratory unit together with a model which features their latest method of obtaining forced air circulation or recirculation in one unit. No. 217.

### W. T. Henley's Tel. Works Co.

Here for the distribution engineer is a display of cables, wires and jointing accessories representing the wide diversity of Henley products. From the cable section come oil-filled and gas cushion cables for use at up to 132 kV down to samples of general purpose cables and cords. The Henley rising main system is a prominent feature, whilst distribution equipment is well represented. No. 31.

### Holophane Ltd.

Newly developed industrial reflector units for high and low bay installations form a prominent feature on the stand, the high bay unit being specially designed to provide efficient performance with the 1.000 W MB/U mercury vapour discharge lamp. No. 74.

### Hoover Ltd.

A variety of fractional h.p. motors and components comprises the Hoover display, noteworthy items being their shaded pole motors which are designed principally for fan driving. To illustrate their size and output, the 1/10 h.p. six-pole machine is only 5¼ in. in diameter yet drives a 20 in. diameter fan. No. 123.

### Hotpoint Electric Appliance Co.

Among this range of domestic heating and other appliances we understand Hotpoint are showing a number of new items, including a dual purpose immersion heater, a 1¼ gallon non-pressure, wall-mounted, water heater and washing machine with its own 3 kW heating element. No. 158.

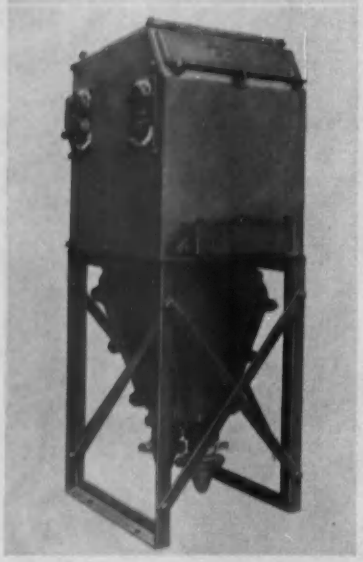
### V. G. Howell and Co.

A range of industrial control equipment is being shown, we understand, with four-point suspension and double tie-bar construction grid resistances, and an improved design of master control switch, as new products. No. 68.

### A. H. Hunt (Capacitors) Ltd.

Likely to attract considerable attention is this year's introduction of miniature oil-filled aluminium cased capacitators, particularly for fluorescent lighting where efforts are being made to reduce fittings size to facilitate their domestic use. Of the foil and paper type, they are impregnated and filled with a special non-inflammable oil enabling safe operation, it is stated, in ambient temperatures up to 70°C. No. 222.

*Section of cubicle construction motor control boards by Electro Mechanical, incorporating contactor starters and switch-fuse gear*



*Top, Ferguson Pailin's miniature multi-circuit control panel and below, the Reyrolle, 11 kV outdoor, oil immersed ring main switch and tee-off fused switch unit*

**Igranic Electric Co.**

The third member of the Metal Industries group, Igranic offer a new brake, the latest addition to their range. Known as type SM, it complies with the A.I.S.E. requirements for brakes having standard wheels and fixing positions for use with the 600 range of mill motors. Closely following the lines of their type M unit; it is suitable for all mill and crane motors. No. 58.

**Imperial Chemical Industries Ltd.**

The young group of insulating materials known under the generic heading of silicones are here for the engineer to inspect. Shown by I.C.I.'s Nobel division, a series of working models demonstrate their outstanding properties, evinced particularly by the specimen of silicone rubber retaining its elasticity at −70°C and, in an electric furnace at +200°C. No. 213.

**Jeary Electrical Co.**

One of several electrical wholesalers exhibiting, Jeary concentrate, as last year, on industrial electrical equipment, especially propeller and axial flow fans, ranging from 9 in. to 36 in. diameter and including units having flameproof enclosures. No. 179.

**Richard Johnson and Nephew Ltd.**

Here for the machine manufacturer and repairer, is a wide range of copper wire, strip and stranded conductors, for general use in the electrical industry. No. 133.

**Johnson and Phillips Ltd.**

To the transformer user, the exhibit of interest forms the centre piece of the stand, where two 100 kVA units compare the weight, size and performance of cold-rolled against hot-rolled steel, the former showing an iron loss of at least 15% less. Item of interest in the switchgear display is an exhibit showing the use of a pole mounting "D" fuse switch and on which a portion of o.h. line is reproduced. No. 108.

**Kent Bros. Electric Wire Co.**

For the industry generally is displayed a representative selection of high conductivity copper winding wires and strips supplied with a variety of insulants. No. 85.

**Kersons Manufacturing Co.**

Among this display of accessories suitable for both industrial and domestic installations is seen a range of moulded e.c. lampholders, whilst "Uni-Quail" 5 A switches and switch sockets are of particular interest, switches up to 3 gang sizes being accommodated in a single section box. No. 99.

**James Kilpatrick and Son Ltd.**

This firm of electrical installation contractors exhibit collective information on a complete electrical service for both home and overseas, together with an example of an illuminated ceiling. No. 16.

**Klaxon Ltd.**

Newcomers to the electrical engineers' exhibition, Klaxon display an exhaustive variety of f.h.p. motors and geared units, available with all known types of winding. Geared units are offered as standard in final speeds down to as low as 1 rev./day, whilst lower speeds can, of course, be arranged. No. 83.

**Lancashire Dynamo Group**

Occupying much of the Lancashire Dynamo group stand is the L.D.C.'s new range of A.A. (Anglo-American) motors, having interchangeable outputs and dimensions for both protected and t.e. "Fankuld" enclosures, whilst 50 c/s motors have outputs and dimensions interchangeable with the new American N.E.M.A. and Canadian C.E.M.A. protected and t.e. fan cooled 60 c/s machines. Also on show for the first time is a 2,000 h.p. 2,980 r.p.m. "Silentvent" motor. No. 57.

**Langley London Ltd.**

Apart from the extensive range of electrical insulation materials offered by this company, a diversity of piece parts is being shown, a feature being their latest development of silicone-bonded glass fabric. Available in tube, sheet and moulded form, it is, of course, eminently suitable for use in high ambient temperatures. No. 152.

**Lewden Metal Products Ltd.**

Emphasis here is given to weatherproof accessories, in which the range offers switches up to 3 gang in 5 A and 15 A sizes, supplied in all gauges with three or four pins whilst 15 A units are also available with five pins. No. 165.

**Linolite Ltd.**

Two new introductions merit attention on a stand devoted to displays of fittings designed specifically for strip lamps. Employing "Maxtrip 2" side-contact lamps, they are the type MA chrome decorative fitting, eminently suitable for decorative use in domestic and commercial installations, and type MSK, a "skeleton" strip of brightened and anodised aluminium channel. No. 176.

**Londex Ltd.**

An ever-increasing range of relays is indicated by a visit to this stand, where new relays include midget units with moulded bases insulators and screw terminals, a calibrated sensitive relay, sealed co-axial relays, and starter relays with auxiliary contacts. Further modifications are seen in the type LF relay, whilst a new timing unit, RFT, is also featured. No. 48.

**London Electrical Co.**

Here the display highlights the service given by this wholesaling firm to the electrical industry, showing the variety of industrial and specialised equipment available ex-stock. Items on show range from asbestos cables, switchgear and distribution accessories to striplighting and heating appliances. No. 126.

**London Electric Wire Co.**

The "Lewcos" group—including the Liverpool Electric Cable Co., Frederick Smith and Co. and the Vactite Wire Co. —exhibit a well-nigh exhaustive display of bare and insulated conductors manufactured to serve the diverse needs f the electrical industry. Included in the range are "Lewmen," "Lewcoglass," "Lewbestos" and other "Lewcos" winding wires and strips. No. 26.

**Longlamps Ltd.**

For decorative lighting installation designers are fittings designed for all versions of architectural lamps, the curved units particularly lending themselves to alcove lighting. Of fluorescent fittings, Longlamps offer batten and heavy industrial trough units for 80 W and 40 W lamps whilst the swallow fitting is also available for 20 W and 30 W sizes. No. 172.

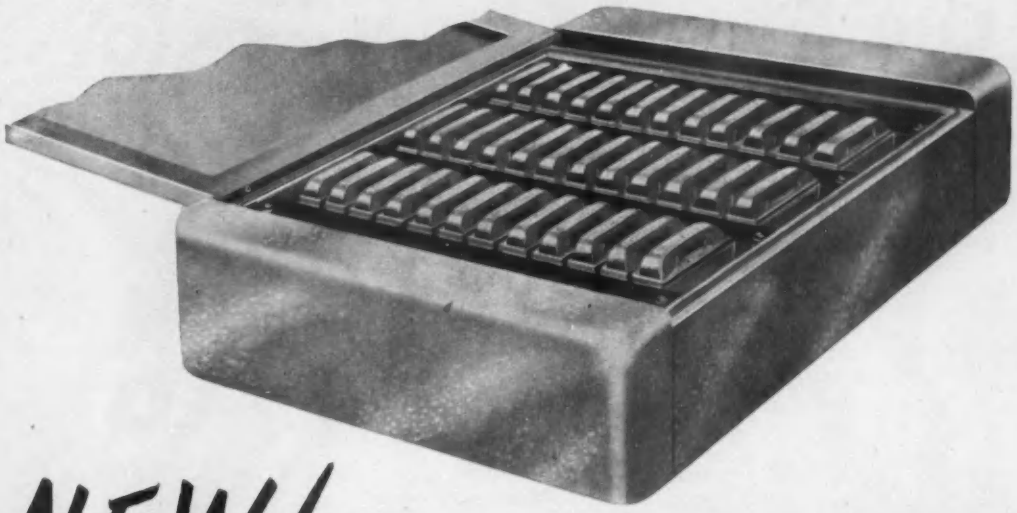
**M. J. Lossos and Co.**

Specialists in electric heating should find much worthy of attention in this display of "Kaloric" convector and unit heaters, the former, in particular, being made in 750, 1,000 2,000 and 3,000 W loadings and available with thermostatic or switch control whichever is preferred. No. 220.

**W. Lucy and Co.**

Included in the selection of Lucy's h.v. and l.v. switch and fuse gear is a complete outdoor substation comprising h.v. oil switch and l.v. network protector, which includes motor recharging and spring-operated c.b. together with potential and reverse power relays. Supplementing this display are ring main and fuse switch units of both extensible and non-extensible types and having tested rupturing capacities of 250 MVA at 6·6 and 11 kV. No. 156.

# SEE THESE ON STAND Nº 112



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**Aeroflex CABINET STYLE**

**DISTRIBUTION BOARDS**

The new range of Aeroflex Cabinet Style Fuseboards has been designed to meet all technical requirements whilst presenting a smooth, unobtrusive and hygienic exterior.

The primary range of boards at present on the market covers the standard ranges of 15 amp and 30 amp sizes in S.P. and N., D.P., T.P. and T.P. & N. form, including an S.P. & N. split-phase form suitable for wiring 2-wire circuits and 4-wire incoming.

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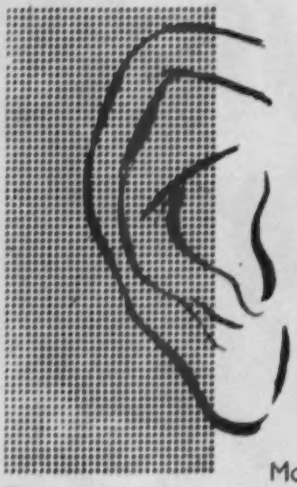

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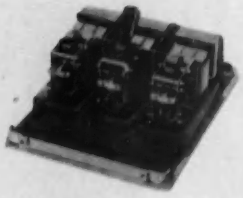
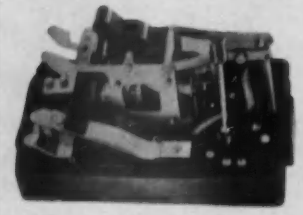
Telephone: ABBey 1060

*Chilton 'Atlas' Miniature H.R.C. Circuit Breaker*



*Chilton 'Atlas' Triple Pole Circuit Breaker*



*Chilton Earth Leakage Circuit Breaker*

CHILTON

STAND 180

*Kub Dry Shaver*

*Buk Dry Shaver*

*Chilton Universal Shaver Socket*

CHILTON

Chilton Electric Products Ltd., Hungerford, Berks. London Office: 19 Old Queen Street, S.W.1 Trafalgar 3035

**Luxram Electric Ltd.**

Diversity could be said to be the theme of this exhibit devoted to electric lamps for all purposes, ranging from tungsten filament types for general purpose use to high quality aeronautical lamps. Of particular interest are examples of machinery for making both filament and fluorescent lamps. No. 194.

**M. and C. Switchgear Ltd.**

The exhibition's theme of electric motor power naturally focuses attention on the examples of M. and C.'s motor starter gear being shown. Of particular interest is their D431 unit type motor control and distribution gear, of which a comprehensive range is available for building into completely metal-clad boards. No. 102.

**Wm. McGeoch and Co.**

For controlling diesel driven alternator sets is a 27·5 kVA control panel, meriting close attention, whilst other control gear includes knife switches up to 10 kA rating and back of board mounting switches and fuse gear in up to 400 A sizes. No. 46.

**Robt. Maclaren and Co.**

Being introduced to the trade at the exhibition are the types MB and MBF thermostats, aimed at meeting the demand for a simple thermostat of small dimensions, low price and having either a limited range of temperature variation (type MB) or fixed setting (type MBF). Designed for incorporation into water heater terminal heads, it is of the conventional stem type using brass and "Invar" as the operating media. No. 131.

**Major Equipment Co.**

Featured here, we understand, are iridescent night lighting effects with u.v. "black" lamps, displayed with a variety of other lamps and lighting equipment. No. 201.

**Mantel Metalworkers Ltd.**

As in previous years, Mantel are showing their "Zedlock" consumers' supply control units, cable trunking and busbar chambers. Special attention is being given to last year's introduction of the "Mantel" rising main system. No. 190.

**Marryat and Place Ltd.**

On show by this electrical contracting firm is their "Barduct" system of electrical distribution, complete with full accessories, available in current ratings of 150 or 200 A, in two- three- or four-pole versions. The busbar system is tapped by means of special tapping boxes, rated from 20 to 100 A. No. 130.

**Martindale Electric Co.**

Featured here is the latest Martindale industrial vacuum cleaner, which combines robust construction with pleasing appearance commensurate with modern ideas. Having a dust capacity of 4½ cu ft and air volume of 154 cu ft, the cleaner employs two motors of a total demand of 1,500 W, a.c. or d.c., and creates a suction of 60 in. water gauge. Another working exhibit is the "Vibroverter" designed to energise cold cathode lighting for vehicles from 24 V cells. No. 1.

**M.C.B. Co.**

Intended essentially for distribution work is this new range of "Lupus" miniature circuit-breakers, which are provided with either universal cable terminals suitable for either front or back entry or special plug-in terminals for distribution boards. Protection is afforded by a magnetically assisted thermal unit, whilst it has a self-contained arc chamber and arc lips are fitted integrally with the main contacts. No. 17.

**Measuring Instruments (Pullin) Ltd.**

Three new models recently introduced have extended the "Pullin" series of multi-range test sets. The units comprise a miniature high sensitivity model of "pocket" size; a larger high accuracy high sensitivity model with current ranges up to 15 A and voltage ranges up to 3 kV a.c. or d.c.; and finally a similar model but of normal 1,000 ohms/V sensitivity and current and voltage ranges up to 10 A and 1,000 V, a.c. or d.c. respectively. No. 2.

**Mersey Cable Works Ltd.**

Here can be seen a comprehensive selection of rubber, thermoplastic and varnished cambric insulated wires, cables and flexibles to cater for requirements of mining, quarrying, generation supply and distribution, to name only a few of many applications. Completing the display are exhibits of thermoplastic pilot cables and improved glands and joint boxes. No. 51.

**Metropolitan-Vickers El. Co.**

In "Motor Way" Metrovick's special exhibit is a 35 h.p. 525 r.p.m. type MDX d.c. motor, one of a series ranging from 7½ to 200 h.p. and designed to conform with the 600 series of the American Association of Iron and Steel Engineers. On the stand itself, virtually every manufacturing section of the company is represented, the heavy plant being in the form of two models—of hydrogen cooled and water-wheel generators, the former being constructed to show the circulation of the cooling medium. Apart from a range of motors, the exhibit also displays its type LG1, 750 MVA, 33 kVA outdoor circuit-breaker. No. 159.

**Midland Electric Mnfg. Co.**

Everything electrical required between supply and motor (apart, of course, from cable and conduit) is the attraction here with a useful display of motor control gear. Prominent are panels showing the "Autoline" and "Auto-Memota," demonstrating their behaviour and protective features under operating conditions. No. 125.

**Midland Silicones Ltd.**

Outlining the properties of silicones, this display will attract the engineer if only for the indication of the range of class H insulating materials. Woven glasscloth coated with silicone varnish is shown, together with varnish impregnated class 4 motors, these materials being recommended for operation at up to 300°C. No. 92.

**M.K. Electric Ltd.**

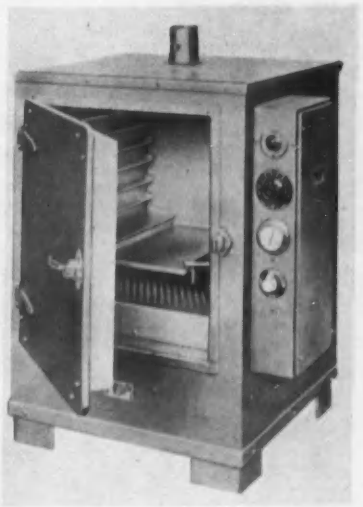
Of importance here are three recent additions to the M.K. range of switches, the flush "Gridswitch" series in particular being designed for high quality use. The switches are mounted on removable grids for easy mounting, the range being made up of interchangeable units for versatility and to facilitate stocking. No. 56.

**Metway Electrical Industries Ltd.**

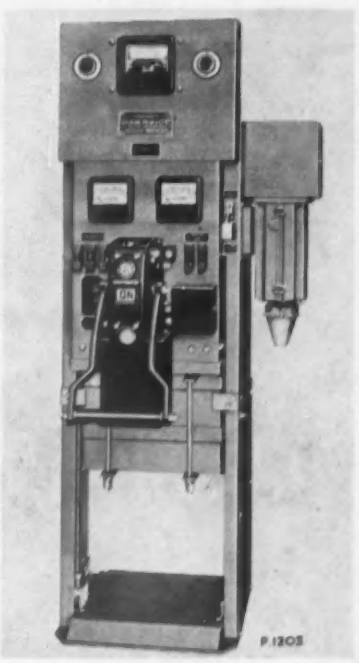
The popular "Miniway" two pint electric kettle is seen here now with an elder brother in the "Miniway de Luxe," an automatic model of the 750 W "Miniway." Accompanying this pair is the new big brother six pint kettle, having an automatic immersion type 2 kW element for rapid boiling. To complete the array of new introductions is an infra-red reflector for poultry breeding, pig farrowing and the like. No. 9.

**Modern Telephones (G.B.) Ltd.**

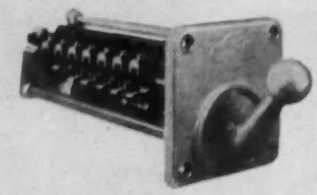
To give an impressive demonstration of their internal communication equipment, the "Modernphone" group are using two stands at opposite ends of the hall. On 106, a general display indicates the three main types of apparatus, of which particular interest will be centred in the 100 line private automatic exchange and the baby 10 line switchboard. Nos. 106 and 194A.



*The Barlow-Whitney standard box oven is shown above, and below, Erskine Heap show this 25 MVA, 400 V circuit-breaker*



*Left, Kerson "Uniquail" 5A switches and right, Ediswan's new 13A plug*



*The "Wemlock" cylinder lock key switch, left, with above, Igranic's seven cam, desk master switch*

*Right, an attractive display of Holophane fittings for industrial and streetlighting use*

**M.T.E. Control Gear Ltd.**

Taken from current production are typical examples of specially designed automatic control panels for such diverse applications as machine tools, refrigerating plant and printing machinery, shown together with a complete range of components and accessories. These include a.c. and d.c. airbreak contactors, timing devices and various relays, whilst standard and semi-standard starters are also displayed. No. 36.

**Nalder Bros and Thompson Ltd.**

The importance of earthing portable tools cannot be over-emphasised and hence, the earth-proving supply point switch merits close inspection, being designed to prevent the tool from being energised unless the earth conductor from the appliance to the outlet is intact. Much of the stand is, of course, given over to a display of instruments. No. 107.

**Nettle Accessories Ltd.**

Among this comprehensive display of wiring accessories is seen a new range of 5 A, a.c. micro-gap switch units in one and two gang versions for use with B.S. 1299 boxes. In their 13 A socket-outlet and fused plug range, several developments are on view, including a moulded rubber plug top and a semi-recessed plaster depth socket to B.S. 1363 centres. No. 147.

**New Day El. Accessories Ltd.**

Taking but one item from this comprehensive display of accessories, there is of particular interest for modern commercial installations the "New Day" series of multi-switch assemblies employing s.p. micro-gap 5 A a.c. only switches, supplied to meet a wide varety of installation requirements. No. 193.

**Newman Industries Ltd.**

Forerunner of a new series of Newman motors is the vertical, hollow shaft pump motor being exhibited for the first time, and is displayed in "Motor Way." Machines in the range itself are designed as s.c. induction machines, having heavy thrust bearings, coupling and non-reverse ratchet for particular use on deep well pumps. On the stand, emphasis is given to flameproof motors. No. 196.

**Nife Batteries**

Whether it be for emergency lighting or power, switch operation, truck propulsion, portable lighting, railway signalling or engine starting, the electrical industry is well served by the compact and robust sources of power in the "Nife" steel-alkaline batteries here displayed. Prominent in a group of "Nife" battery-operated equipment for all applications is a "Nife-Neverfayle Minor" emergency lighting set. No. 167.

**Oldham and Son Ltd.**

Among this range of portable power and lighting units is the latest series of Oldham safety handlamps, meeting a variety of industrial needs. These lamps include the G.W. cap lamp and the G.W.-H. cap lamp, the only electric cap lamp to be passed as safe for use in atmospheres containing hydrogen and a number of other explosive gases. No. 53.

**Ottermill Switchgear Ltd.**

Featured as a newcomer here is the "Ottermill" miniature busbar trunking system, ideally suited for distribution in machine shops and similar installations. Specifically designed for the smaller installation, it provides a "take-off" position at 2 ft intervals, power connections being made in a matter of minutes via combination fuse units. No. 216.

**Parmiter, Hope and Sugden Ltd.**

Two new developments being shown for the first time feature among equipment displayed on this stand, one being a cabinet-style distribution board, which, dustproof and practically waterproof, has a streamlined finish to tone with modern industrial design. Equipped with "Aeroflex" rewireable or h.r.c. cartridge fuse links in 15 or 30 A ratings it is available in a number of alternative arrangements. Supporting this display is a new range of "Aeroflex" energy-limiting fuses. No. 112.

**Partridge Transformers Ltd.**

Prominent here is a new series of portable and wall-mounted l.v. transformers covering outputs from 25 VA to 5 kVA. Other exhibits include transformers up to 100 kVA, X-ray and h.v. testing transformers and furnace units delivering up to 5,000 A. No. 178.

**Partridge, Wilson and Co.**

Rectifying equipment of every type and up to 100 kW is the main feature of the "Davenset" stand, units for plating, engine starting, battery charging, cathodic protection and motor supply being demonstrated. Transformers in a diversity of designs, from 5 VA to 500 kVA are also to be seen, including units complying with the B.E.A.'s T.1 specification. No. 66.

**Permanoid Ltd.**

A recent introduction here is an extensive range of multicore flexible cables from two to twelve cores, both screened and unscreened. Constructed with p.v.c. insulation and sheathing, they are primarily designed for aircraft use, but should find considerable application elsewhere. A comprehensive display of t.v. down leads and h.f. cables is also on show. No. 223.

**Philips Electrical Ltd.**

On one of their two stands Philips feature lighting equipment, particularly their "Gear-less" fluorescent lighting system, in which further additions are now available. The system dispenses with starters and other control gear, employing only tungsten filament lamps as ballast. The industrial stand shows the diversity of products now supplied, the 2·5 kW induction heating unit being demonstrated. Nos. 19 and 177.

**Pinnes Electrical Products Ltd.**

Here, the fluorescent lighting specialist can inspect the range of fittings offered. Two trough units are available with either closed or open ends, the latter being suitable for fitting in rows. A hexagonal-shaped batten fitting is also offered together with a seagull reflector unit for surface mounting or chain suspension. No. 79.

**Porter Electrical Products Ltd.**

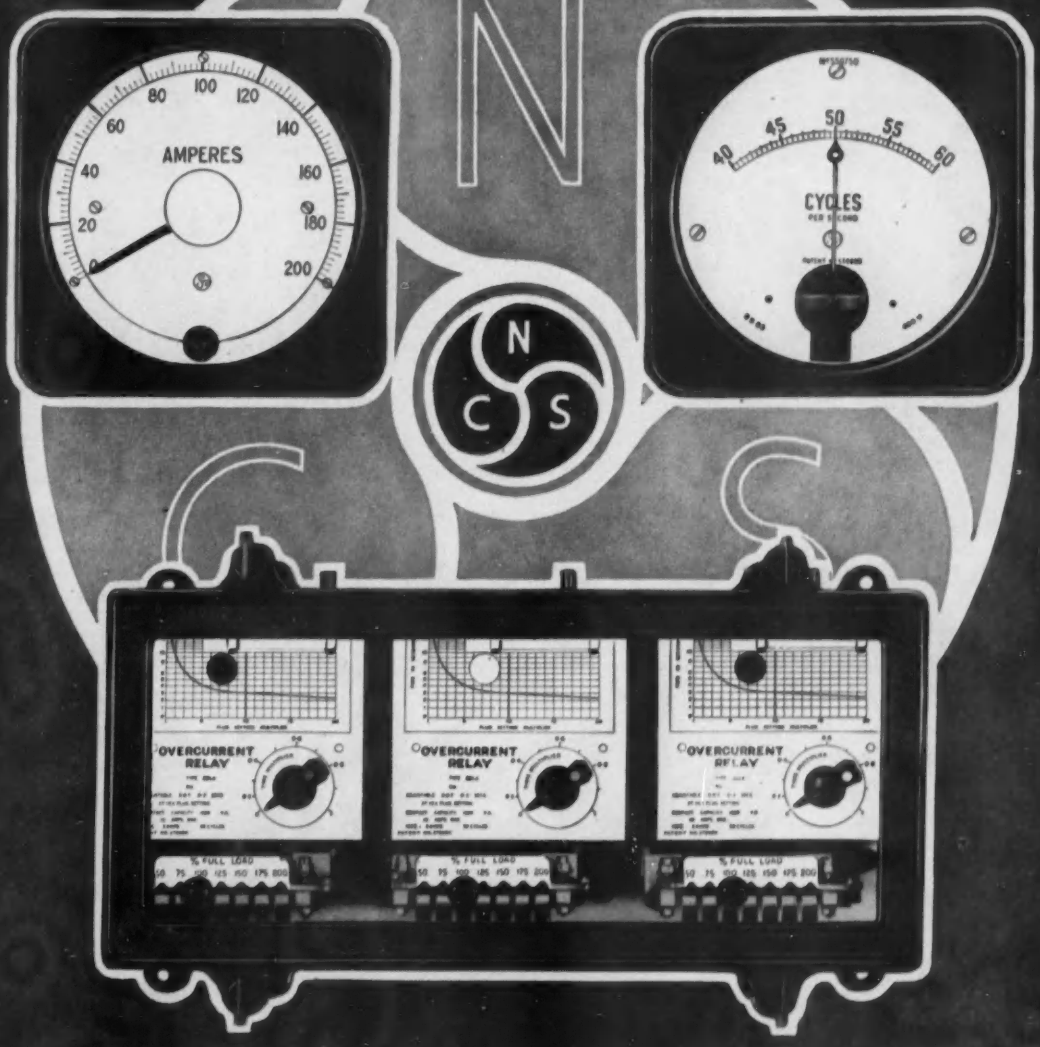
Making its bow here is the "Fulgrip TIC" bonding clamp assembly, for use with the firm's "Portaway" earthing system and worthy of close attention by installation engineers. Ensuring efficient installation earthing, the system is supplied complete with accessories for bonding the earthing strips together and to other metal parts whilst a "Dyrod" earthing plate is also available. No. 33.

**Power Centre Co.**

Of particular interest to installation engineers is the 100 A miniature busbar trunking incorporating all-insulated busbars and tapping points at 2 ft centre. Associated fixed-type fuse boxes are of 15 A and 30 A sizes, whilst the same design of trunking can also be adopted for larger current ratings. No. 215.

# NALDERS

INSTRUMENTS AND RELAYS

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**EARLS COURT · MARCH 15-19 · 10 a.m.-7 p.m.** **STAND 107**

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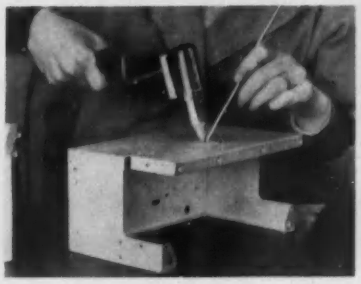
C4570

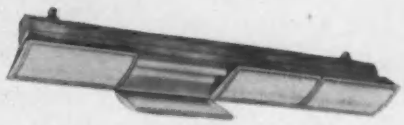
*British Central Electrical are demonstrating soldering on aluminium, as shown below*



*Below, the use of Benjamin's diffusing "Visor" screens is depicted*

*The miniature 20A d.p., a.c. control switch with neon indicator by Santon is shown above*

*Above, Revo's new consumer's service unit*



**Power Connectors Ltd.**

Specialising in termination and connector equipment, for transmission lines and substations, this firm show a selective display of standard types of particular interest to the supply engineer. No. 35.

**Pritchett and Gold**

Where lighting failure gives rise to danger, provision for emergency lighting is a necessary requirement of the installation and for this purpose can be seen a typical P. and G. automatic emergency lighting set. Housed in a sheet steel cubicle, the charging and control is arranged to connect, on event of a supply failure, the emergency lighting circuit to a battery of 14 Planté type closed top cells. No. 127.

**Pyrotenax Ltd.**

This display indicates the use of mineral-insulated cables for power and lighting installations, with emphasis on its use for rising mains. Other applications suggested are earthed concentric and catenary wiring, whilst expert staff are available to advise on sealing and other techniques. No. 37.

**Radio Heaters Ltd.**

One of the prominent exhibits here is the "Radyne" electronic forge, a 6 kW induction heating unit ideally suited for general workshop brazing, soldering and heat treatment. The high amplitude r.f. output current available, coupled with the range of output control, makes for the claim that the unit will deliver its full output into practically any soldering or brazing work coil. No. 50.

**Ranton and Co.**

The complete range of electrical accessories shown here include lampholders, push buttons, ceiling roses, batten holders and the like, whilst samples of general mouldings indicate their activities for the industry in this field. No. 50.

**Rawlplug Co.**

One of today's installation problems centres on the difficulty of making fixings to the wide variety of proprietary wall material now in use. Accordingly, Rawlplug are staging demonstrations of unusual fixing devices designed for such walls as soft plaster boards, thin wall boards, plastic panelling, fibrous compositions, hollow pot and the like. No. 184.

**Record Electrical Co.**

Foremost among this variety of products is the "Cirscale" range of instruments having scale lengths of twice the instrument diameter. The latest addition is the series A which covers a full range of a.c. and d.c. requirements. Having a 3½ in. platform dial the scale subtends 240° and flanges are square flush type. No. 93.

**Revo Electric Co.**

Much of the stand here is given over to lighting equipment, including a variety of street lighting lanterns suitable for Groups A and B roads. Of special interest is the C.14446, a vertical unit for wall mounting and comprising a cast aluminium canopy and base with an enclosing member of reeded "Perspex" designed for three 5 ft 80 W lamps. No. 163.

**A. Reyrolle and Co.**

Reyrolle are showing a representative range of industrial and distribution switchgear up to 33 kV, including an outdoor 33 kV, 500 MVA oil-breaker circuit-breaker with three phases in one tank operated by a motor charged spring closing mechanism. For industrial use is a 440 V, 1,600 A, 25 MVA air-break c.d. with air insulated back-port, shown coupled to a distribution switch and fuse board with 2,000 A busbars. No. 18.

**Rheostatic Co.**

Foremost exhibit in the "Satchwell" stand is a new electric water heater control which should excite considerable interest. Among other products are cooker thermostats, including stem and liquid expansion capillary types. No. 146.

**Rolls Switches Ltd.**

Exhibited here is a variety of Rolls 5 A switches, available in round surface and flush and gang types, and in a surface ironclad version. No. 89.

**Wm. Sanders and Co.**

Major changes in this firm's range of products are to be noted, particularly in fuseboards and fused switches, whilst representative examples of light, medium and heavy duty switch are shown. "Sandaclad" fused switches are shown in various applications for which they are suitable, together with a diversity of wiring accessories. No. 77.

**Santon Ltd.**

A variety of new products is to be seen, particularly noteworthy being the new "Monmouth" dual purpose thermal storage water heater. It is fitted with two 3 kV heaters, incorporating fixed setting thermostats, one providing small quantities of water at 140° F for sink or normal culinary purposes, and the other, fitted at depth, for larger quantity heating to 160° F or 180° F. No. 140.

**G. H. Scholes and Co.**

This range of "Wylex" acressories and small switch and fuse gear shows the new "Extenso" system for extensions to existing fuse unit installations. Consumer control units are also displayed, available in either metalclad or all-insulated versions and available in up to 8 ways for rewireable or cartridge fuses in any combination of 5, 15 and 30 A sizes. No. 96.

**Scottish Cables Ltd.**

Here is exhibited a representative range of products, particularly cables and flexibles for domestic use, whilst a display unit illustrates applications of larger power cables. Further features show a sectional model of a 33 kV cable joint and uses of "Renex" anti-corrosion protection. No. 62.

**Siemens El. Lamps and Supplies Ltd.**

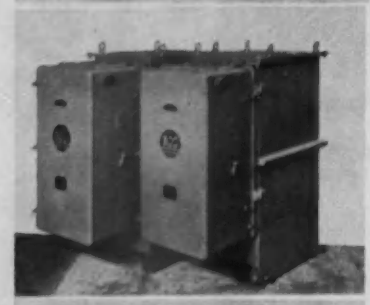
The Siemens group feature, particularly for municipal authorities, is the first public showing of the "Kuwait" fluorescent street lighting lantern, designed for the Arabian city whose name it bears. Similar attention should be focused on the "City" vertical wall mounting fluorescent lantern now gaining increased use in London. Specially featured for artistic domestic use is the "Fleurlite" range of fittings. No. 198.

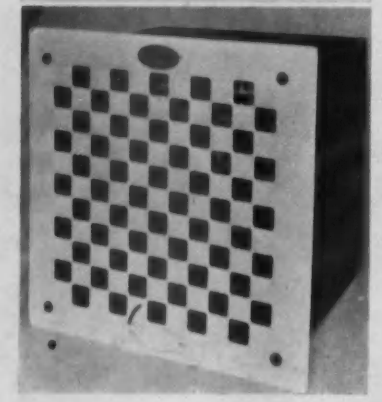
**Simplex Electric Co.**

This exhibition marks the introduction of a new well glass lighting unit, available in the two corrosion resistance finishes of cast aluminium or vitreous enamelled cast iron. A variety of attachments make this unit adaptable to many methods of fixing. Switchgear exhibits include a heavy duty industrial free standing 25 MVA switchboard. No. 88.

**H. C. Slingsby Ltd.**

For the engineer are displayed here many kinds of handling equipment, a prominent feature being the "Slingsby-Verrolec" machine mover skates. Having a capacity of from 20 to 100 tons, they are eminently suitable for moving heavy machinery, electric motors and equipment rapidly. No. 153.





*From top to bottom: The English Electric 33 kV t.p. 750 MVA o.c.b.; two T.C.C. p.f. correction capacitors fitted with contactor switchgear; the stylish Martindale Model 120 industrial vacuum cleaner; and a wall fan with closeable grill, by Fenton, Byrn*

**Slough Metals Ltd.**

For manufacturers concerned with obtaining castings of non-ferrous metals, this firm shows, in a wide range of aluminium castings, the nature of their activities in sand and gravity die casting. No. 103.

**Small Electric Motors Ltd.**

The result of three years development is a notable welding equipment shown here, comprising a medium frequency single phase a.c. alternator. Considered to have the advantages of shielded atmospheric welding, and aluminium and stainless steel welding over their d.c. counterparts, these machines are particularly suited to site welding. No. 219.

**Smith's English Clocks Ltd.**

With the growing popularity of electric clocks, particularly now that electricity supply is an accurate and reliable power source, the range of "Sectric" clocks has been further extended, as is shown here, in this display of both well tried and attractive new models. No. 189.

**South Wales Switchgear Ltd.**

On show for the first time is the firm's "T type" switch fuse gear, which, of flush-fronted design, is suitable for service at up to 660 V and 800 A. It is constructed to be used in conjunction with l.v. oil circuit-breaker units also made by the firm, thus forming composite o.c.b. and switch fuse boards, with cable jointing either front or rear. No. 152A.

**Standard Telephones and Cables Ltd.**

Portrayed in diagrammatic and model form is the simplicity of operation of a typical 132 kV oil-filled cable installation, showing the ease with which it can be accommodated to bulk power transfer requirements. Featured in the exhibit is the control of oil pressure and the elimination of voids. No. 40.

**J. G. Statter and Co.**

Included in the range of switchgear exhibited for use on l.v. systems is the series of air break circuit-breakers, having an A.S.T.A. tested and proved rupturing capacity of 26/31 MVA at 415. High voltage switchgear includes the "VL" metalclad automatic oil-fused switch unit of the "trips-all phases" type. No. 161.

**Strand El. and Engineering Co.**

This firm of stage lighting equipment specialists showing units ranging from a new 250 W spotlight fitting using the Class T projector lamp to an arc lamp consuming 18 A a.c. whilst stated to give a light output equivalent to an arc current of 90 A d.c. No. 181.

**Sun Electrical Co.**

Displayed here are a variety of products demonstrating not only the equipment manufactured by Sun but the wholesaling service they offer to the electrical industry. No. 185.

**Sunvic Controls Ltd.**

Prominent here is the type TQB water heater thermostat meeting a demand for simpler immersion-type thermostats which can be set to a predetermined temperature. A compact unit, its design employs a straightforward bimetal-operated snap action switch, rated at 15 A at 250 V a.c. No. 28.

**H. D. Symons and Co.**

In the light of the motive power theme of the exhibition, prominence here is given to varnished fabrics and slot insulation used in the manufacture of electric motors. Growing interest in Class H insulation is also reflected in "Symel" silicone elastomer products, whilst extruded "Nylon" products are a recent development. No. 34.

**Synchronome Co.**

For accurate timekeeping at all times is this range of electrical horological and timing equipment, including, we understand, impulse clocks, chimes and discrepancy timing indicators. No. 78.

**Synthetic Carbon and Engineering Co.**

For the motor manufacturer are shown carbon brushes of all shapes, grades and fittings, of particular interest being the newly-developed metallised carbon contacts having the advantages of higher conductivity whilst retaining good impact strength, low friction and freedom from welding. No. 15.

**Geo. E. Taylor and Co.**

Here the display indicates the variety of home and overseas experience in engineering and contracting work, and features show the comprehensive consulting, designing, drafting and installation service offered. Examples of workmanship are shown together with the "Taylor" earth. No. 202.

**Telegraph Condenser Co.**

With the importance of p.f. correction so often emphasised, attention on the T.C.C. stand is given to static capacitor units, ranging from tank types fitted with o.c.b's to pole mounting models, with a demonstrator showing the advantages of p.f. correction. Motor starting and interference suppression capacitors are also featured. No. 148.

**Telegraph Const. and Maint. Co.**

Telcon's Cables Division show paper insulated power cables of all types for voltages up to 22 kV, having aluminium or copper conductors, and lead or aluminium sheaths. Another feature comprises polythene-insulated power cables up to 11 kV for underground or submarine use, together with a polythene insulated 11 kV, three-core aerial cable with centenary suspension cable attached. No. 191.

**Tetra Engineering Co.**

Manufacturers of mineral embedded heating elements, Tetra display samples of specially-formed heaters and sections showing the compaction obtained during manufacture, an important factor in ensuring heat transfer. The Import Division exhibit products manufactured by a number of overseas firms. No. 207.

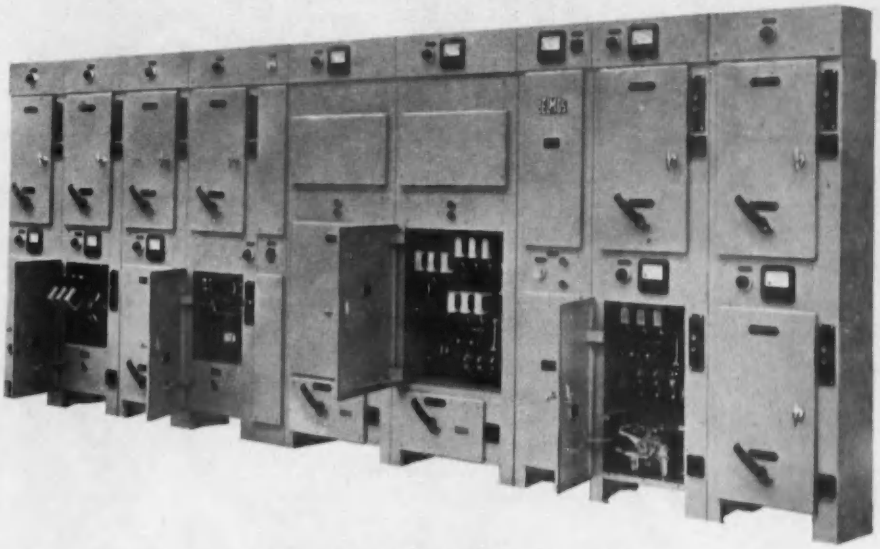
**Thermodare (Gt. Britain)**

Demonstrating the advantages of thermal storage electric space heating is this display of "Thermodare" units, available in three sizes from 1·0 to 2·0 kW. Such units are ideally suitable for all commercial applications, and a recent development is a metal top for fitting over the heaters for offices where space is at a premium. No. 64.

You are invited to inspect

# stand 209

THE ELECTRICAL ENGINEERS' EXHIBITION - EARLS COURT



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**SWITCHGEAR AND MOTOR CONTROL GEAR**
for **FLAMEPROOF AND INDUSTRIAL** application
will be on view

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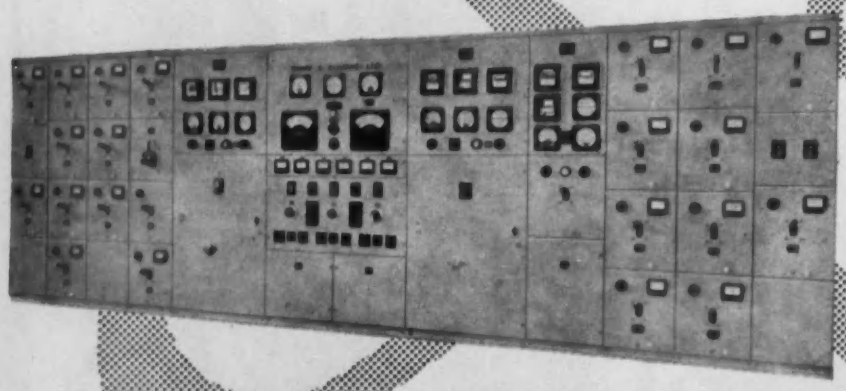

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W.20

**Thorn Electrical Industries Ltd.**

Dominating the "Atlas" stand is a large sphere used to demonstrate a number of unusual lighting effects, whilst another eye catching feature is a 14 ft fluorescent wall of continuously changing colour controlled by electronic light-mixing equipment. To indicate the quality of fluorescent lighting control gear is a ballast-testing machine. No. 210.

**F. W. Thorpe Ltd.**

Industrial lighting is the keynote of this display, particularly interesting from the installation viewpoint being the "Slyda-long" system of continuous trunking and fluorescent lighting in which reflectors can be slid to any desired position. For outdoor lighting is the "Adjustaflood" series of floodlighting lanterns. No. 8.

**T. M. C. Harwell (Sales) Ltd.**

A full range of "Temco" electrical wiring accessories is displayed in a modern setting, a particular feature being an enlarged working model of the a.c., q.m., q.b. switch action used in their series of switch sockets. Completing the stand is a selection of "Temco" synchronous electric clocks. No. 182.

**Troughton and Young Ltd.**

Here the stand is designed to display a new range of fluorescent lighting fittings for industrial and commercial purposes. Additions to the "Tubalux" series, they comprise a variety of designs for single and twin, 40 W and 80 W lamps, including a new conception of an industrial trough reflector giving both upward and downward lighting. No. 162.

**J. H. Tucker and Co.**

In this range of accessories are seen this year's new products of 5 and 15 A resilient moulded plugs, 15 A ironclad protected surface switch assemblies and adjustable cast iron grid boxes up to 24 section. Features also illustrate special assemblies constructed for individual requirements. No. 99.

**Tudor Accumulator Co.**

Emphasis here is placed on stationary batteries used for switch operating and emergency duties in power and substations. Typical cells from the various ranges available include high performance units specifically developed for the high rates of discharge involved in e.h.t. switch closing. No. 42.

**Tufnol Ltd.**

In this display of "Tufnol" sheet, tube and rod are interesting examples of components moulded to specification or machined from the basic form with the usual engineering tools. Many such components perform mechanical as well as electrical service, such as the electrical insulator for supporting current carrying rails on electric railways. No. 144.

**Uni-Tubes Ltd.**

As in last year's exhibition, the feature here is "Kopex" pliable electric conduit, capable of being set by hand, and made from strip materials of either three all-metal laminations, or a combination of metal and bitumenised paper. For corrosive atmospheres, a p.v.c. sheathed version is available. No. 174.

**Vanguard Engineering Co.**

Of special interest to the lighting fittings industry are these examples of fluorescent lighting control equipment, displayed together with specially-designed fittings and transformers. No. 221.

**Varilectric Ltd.**

Switchboards of compact design are a feature of this company's range, which includes units of 30 MVA A.S.T.A. tested rupturing capacity from 60 to 750 A rating. A typical board is being shown, with o.c.b.'s mounted in the centre section, and technical staff are available to discuss problems associated with all kinds of control panels. No. 188.

**V.G. Porcelain Co.**

This member of the "Ashley" group exhibits examples of porcelains and refractories for the electrical industry. Among the components on show are silver, platinum or nickel metallised ceramics for seals and similar purposes, interlocking and cylindrical beads, formers for instrument makers, fuse barrels, and "Scruit" conductor connectors in four sizes. No. 142.

**Volex Electrical Products Ltd.**

To take but one item from this display of accessories and plastic lamp shades, the "Volex" a.c. only tumbler switch is a good example of the standard attained in these products. The design is particularly compact; the switch mechanism itself being completely shrouded in a plastic housing. No. 82.

**V. G. Walker and Co.**

A new addition to this firm's range of installation equipment and accessories likely to attract considerable attention is an overhead busbar trunking system for workshop distribution. Take-off boxes are supplied in the usual ratings. No. 135.

**Walsall Conduits Ltd.**

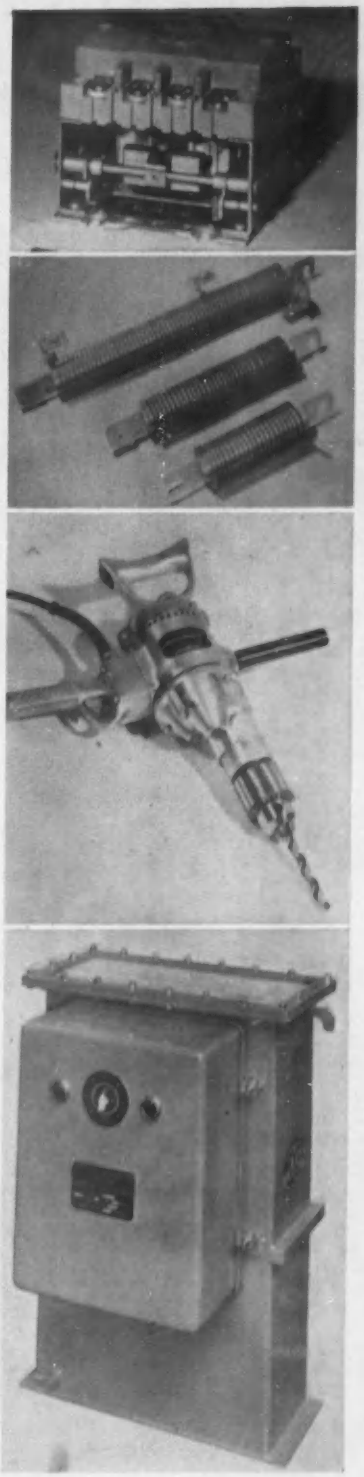
The diversity of electrical installation work is reflected in this array of equipment, ranging from the "bread and butter" work of conduit and conduit fittings to "sparkless" control units and bedhead units for hospital installations. Of particular interest is new flameproof equipment, extending the range available. No. 24.

**Wandsworth Electrical Mfg. Co.**

To comply with the safety requirements for hospital operating theatre installations are these examples of mercury, "spark-less" switchgear, which now includes a new 30 A capacity switch specifically designed for mobile X-ray apparatus. In other designs are seen the "Wemlock" range of cylinder lock switches and switch plugs, suitable for use where unauthorised switch operation is to be prevented. No. 54.

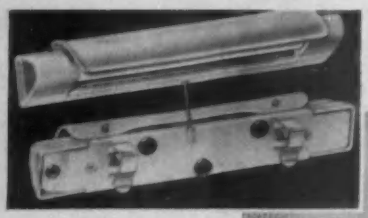
**Watford Electric and Mfg. Co.**

Exhibits here comprise a selection of automatic starters and contactor gear, a notable item being a portion of a starter switchboard taken from current production. The latest design of 3·3 kV direct switching starter cubicle for s.c. motors of up to 1,000 h.p. is also to be seen. No. 218.

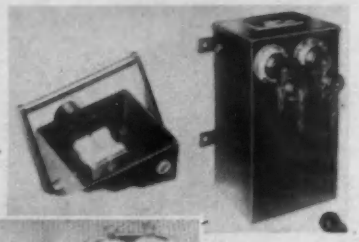


*From top to bottom are seen, Arrow's No. 1 size, 30A contactor, "Berco" grid coil resistors for assembling into banks, the standard Black and Decker ¾in. drill for industrial use, and a 36 kVA tank type capacitor with contactor panel, fitted with "Perspex" inspection panels*

Below, the Linolite clip on, striplamp fitting



Left, a self contained, steel clad tripping unit by Nife Batteries, and right, Hunt's miniature oil-filled aluminium cased capacitors



Above, Partridge Transformers' portable low voltage lighting transformer, with fuses exposed

**Watliff Co.**

For the electric motor industry is here exhibited an exhaustive range of commutators and slip rings, of both fabricated and moulded construction, and catering for machines of all sizes. Of particular interest are units designed to operate at high speeds or to withstand wide temperature variations. No. 115.

**Weir Electrical Instrument Co.**

A novel display on this stand comprises new moving-coil instruments in which the central core magnets have been made from sintered magnetic material. Other products include a transductor unit capable of measuring direct current up to 12·5 kA. No. 129.

**Westinghouse Brake and Signal Co.**

A special feature of this year's Westinghouse stand is its display of high performance metal rectifier equipment manufactured for individual applications. They point out that equipment can be designed for almost any application and as examples, show power units for the "Sparcatron" spark-cutting machine, the "Dalic" plating process, for cinema projector arcs and for Service use in the tropics. No. 158.

**Westool Ltd.**

Now being manufactured under licence in this country, the Warner electromagnetic clutches and brakes are prominent on this stand, and suggest a wide variety of machine control applications to supersede elaborate mechanical devices. No. 204.

**Westwood Switchgear Ltd.**

To be seen here are examples of their compact "Unit Assembly" switchboards with integral wiring chamber, which gives access for wiring from both front and rear. Single units, partially dismantled to show interlocks, operating mechanism and the free handle arrangement to prevent "inching" are featured. No. 183.

**Whipp and Bourne Ltd.**

Engineers concerned with marine installations are specially catered for here by a typical a.c. marine-type switchboard suitable for working on a 440 V, three phase 60 c/s system. It is shown fitted with withdrawable pattern a.c. air-break circuit-breakers up to 900 A capacity, these being A.S.T.A. certified up to 25 MVA rupturing capacity. No. 61.

**Wm. White (Switchgear) Ltd.**

One item in this range of switch and fuse gear is an interlocked neutral type of s.p.n. fuse distribution board of a design providing a hinged neutral link for each single phase way. The interlocking device prevents the link being opened before the fuse has been removed, and the fuse may not then be replaced until the link has been reclosed. No. 149.

**Henry Wiggin and Co.**

This firm is now in a position to introduce various nickel alloys in wrought form using a powder metallurgical technique, and such materials, for a variety of special applications, are displayed together with other grades of nickel. No. 169.

**Woden Transformer Co.**

New this year, we understand, is a 5 kVA pole mounting transformer using the "C" core, which is also employed in a 30 kVA water-cooled welding transformer for use with press welding machines. No. 120.

**Woods of Colchester Ltd.**

Where silent operation is an essential requirement of fan installations, Woods are now offering a silencer for their "Aerofoil" fans. A simple cylinder without splitters or baffles, it is a standardised unit stated to reduce substantially the noise emission. No. 195.

**Yorkshire Switchgear and Eng. Co.**

Pride of place here is taken by a seven panel 11 kV switchboard of 150 MVA rupturing capacity suitable for outdoor service. It is similar in character to their indoor service switchgear, no additional protection being required apart from weatherproof cabinets for instruments where used. No. 75.

## *Non-Manufacturing Organisations*

NO report of an electrical exhibition would, of course, be complete without reference to the Electrical Associations and other organisations, who are well represented at this year's show. Foremost comes the Electrical Development Association (No. 22), whose stand highlights their work in promoting the extended use of electricity by all types of consumer. The British Electricity Authority (No. 30) illustrates some of the progress of the Supply Industry during the last 30 odd years, drawing attention to the programme of new plant up to 1959, and, as last year, they have also made arrangements for visits to Battersea and Fulham Power Stations, details of which are available at the stand. On the E.R.A. stand (No. 20) indication of current research is displayed, together with a number of working exhibits.

Representing the fair sex in the industry is the Electrical Association for Women (No. 7) who feature their kitchen replanning competition with the plan and model of the winning entry in which the saving in time, labour and fatigue to the housewife is highlighted. At the neighbouring stand (No. 6) the E.I.B.A. have their bureau providing information on the social service given by this organisation, whilst the Association of Supervising Engineers, to whom must go congratulations for pioneering the concept of the exhibition, have on Stand 20 a display of publications referring to their activities.

Of the trade associations, the C.M.A. (No. 10) stands out with its "Roman Warrior" figurehead, sufficient for many as a standard of quality, over a display indicating interests and achievements of the Association. On Stand 13, the E.C.A. indicate the scope of their organisation and the work carried out by its members, and the E.W.F. display (No. 11) illustrates the wholesaling service given to the industry by its 204 members.

*Starter switchboard for a large refrigeration plant installed in a modern brewery.*

The above illustration shows a modern example of a starter switchboard based on standard units but custom built to suit the plant it controls.

Our technical representatives are at your service to help with your control gear problems, using standard starters or custom built equipments.

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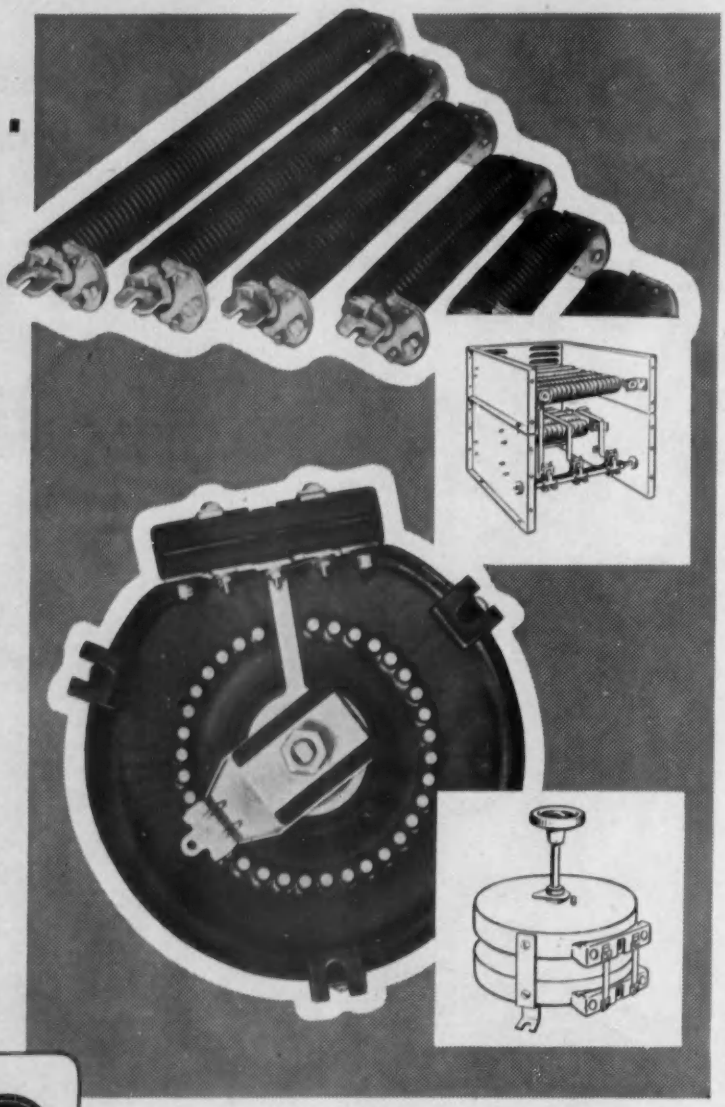

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LP Stud Type Industrial Rheostat. 9" diameter, 400 watt rating. Elements embedded in vitreous enamel and enclosed in steel cover. Suitable for shunt field regulation, control of welding plant, electric oven temperature control, dimmers, etc. Multiple banking enables increased rating to be obtained or simultaneous control of separate circuits.

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BR1301-A

# Suppression of Interference

## *Regulations for Motors and Refrigerators*

ON the 1st March, two Statutory Instruments were laid before Parliament. The object of the two sets of regulations is to cut down the amount of interference arising from the use of electric motors—and generators—and from refrigerators. Both sets of regulations come into force on 1st September, 1955, and they lay down the requirements which must be complied with (*a*) by manufacturers, assemblers and importers of all electric refrigerators and (*b*) by users of new and old electric motors.

### *Refrigerators*

The Statutory Instrument (No. 292, The Wireless Telegraphy (Control of Interference from Refrigerators) Regulations 1955) dealing with refrigerators lays down that the refrigerator shall be so designed and assembled, and that such precautions shall be taken (by the fitting of a suppressor or otherwise) to ensure that the voltage of electro-magnetic energy at the supply terminals of the refrigerator shall not exceed (*a*) 750 microvolts in the range 40-70 Mc/s, and (*b*) 1,500 microvolts in the range 200-3,605 kc/s.

It will be noted that in this case, the Instrument is concerned exclusively with interference which may be fed back into the mains, and the requirement must be complied with in the case of all refrigerators sold otherwise than for export, or offered or advertised for sale (otherwise than for export), or let on hire or offered or advertised for letting on hire by any person who in the U.K. manufactures, assembles or imports refrigerators. An exception is made in the case of refrigerators designed to be used exclusively in a vessel, vehicle or aircraft. It should, however, be noted that interference from existing refrigerators is covered by the regulations for motors.

The definition of "refrigerator" in the Instrument means apparatus used, or designed to be used for the purpose of refrigeration which, or any part of which, generates, or is liable to generate, fortuitously electro-magnetic energy at frequencies of 3 million Mc/s or less when it is in operation. The definition also includes any switchgear forming part of or directly associated with that apparatus, whereby it is made to operate and to cease from operating.

### *Motors*

Electric motors below 1 h.p. per 1,000 r.p.m. are covered in Statutory Instrument No. 291 (The Wireless Telegraphy (Control of Interference from Electric Motors) Regulations 1955). In addition, however, generators or convertors having a continuous rating of less than 0·75 kW or kVA per 1,000 r.p.m. are included. The requirement listed shall be complied with in the case of any electric motor if it is to be used within the United Kingdom.

As far as the interference level at the motor terminals is concerned, the requirement of voltages is the same as that quoted above for refrigerators. There is, in addition, a requirement that the field strength of the electro-magnetic energy radiated in any direction from the motor shall not exceed (i) 50 microvolts per metre at any frequency in the 40/70 Mc/s range, and (ii) 100 microvolts per metre at any frequency in the range 200 kc/s to 1,605 kc/s at any distance of not less than 33 feet.

Both the Statutory Instruments define the equipment required to carry out the necessary tests which is similar in both cases and consists of calibrated radio receivers together with the necessary resistive and reactive networks for measuring terminal voltage interference, and aerials and feeders for measuring field strengths. Method and conditions of measurement are also included.

It has been pointed out by the G.P.O. that the introduction of the electric motors regulations does not mean that everyone using vacuum cleaners, hair dryers or other electrically powered domestic articles will have to fit a suppressor at once. Only a proportion of these appliances cause interference and the Postmaster-General hopes that in such cases the owners of the appliances will co-operate by having the trouble put right when it is pointed out to them by the Post Office. The new powers will be used only where it is necessary for the Post Office to insist on an appliance being put right and the owner will not voluntarily have a suppressor fitted.

It is also hoped that there will be a progressive extension of the current practice of certain manufacturers who produce appliances with suppressors incorporate or who provide for the easy addition of a suppressor.

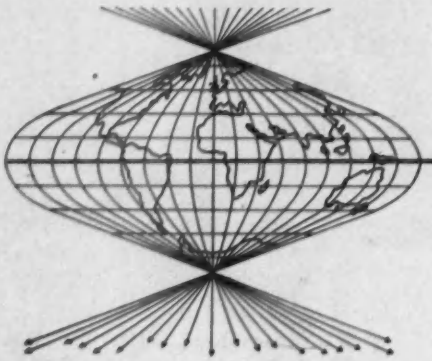
The standards of level and the frequency ranges included in the regulations have been based on data derived from sound and television broadcasting services, and are expected in addition to give protection in the f.m., v.h.f. sound transmission in Band II (87·5/100 Mc/s) and to aid in Band III television.

It is also pointed out that correct earthing is even more important where interference suppressors are fitted to an appliance. Components of suitable quality should be used in suppressors, and should be correctly connected in circuit. Reference should be made to B.S. 613 "Components for Radio Interference Suppression Devices," and, when it has been published in the near future, to the B.S. Code of Practice on "The General Aspects of Radio-Interference Suppression."

### *Practical Implications*

To consider the practical implications of these regulations, it is first necessary briefly to consider the reason for machinery to cause radio interference, although operating on direct or alternating current at power frequency, neither in itself being capable of being received in the input circuit of a radio receiver. The operation of this machinery, however, usually involves the interruption of the current and it is the waveform of the interrupted wave which can contain frequencies extending to the radio range.

Since these e.m.f.s appear only when the circuit is broken, they then appear across the external circuit, sending a current round the circuit. By this means, the current may cause a radio frequency e.m.f. to appear on the supply lines as one form of interference; an e.m.f., on the other hand, may be induced in neighbouring conductors as a result of the current; or finally, the external circuit may itself act as a transmitting aerial, all three media causing a radio frequency interference signal to be received by the radio set. To suppress the interference, therefore requires the r.f. currents in the external circuit to be reduced. This can be effected, firstly, by fitting a suitable low impedance (capacitor) across the source to reduce the magnitude of the e.m.f.—often in itself sufficient—and, secondly, by inserting a suitably high impedance (choke) to the r.f. currents in the external circuits.



# OVERSEAS NEWS

*A SUMMARY OF IMPORTANT EVENTS*

## CANADA

### New B.C. Switching Station

To improve its Vancouver Island transmission system, the British Columbia Power Commission is to construct a new 132 kV switching station at Dunsmuir, at a cost of $570,000. Work is to start in Apr., and the station is expected to be in full operation early next year. Bulk of the power generated at the Commission's John Hart development on Campbell River is transmitted 90 miles to Nanaimo, over two 132 kV circuits. One of these circuits loops through Alberni, adding another 28 miles of transmission line. The new Dunsmuir switching station will be constructed at the junction of the take-off to Alberni, shortening the transmission distance to Nanaimo and strengthening the line by dividing it into smaller sections. The new station will be remotely controlled from the Jingle Pot station at Nanaimo.

### Site for Nuclear Station?

The Nova Scotia Light and Power Co., has made a proposal to Atomic Energy of Canada Ltd., for participation in the construction of Canada's proposed experimental nuclear power plant designed to produce about 20,000 kW, we learn. Consideration is being given to siting the plant in the Atlantic provinces, probably in the Annapolis Valley, it is stated. Mr Howe, Federal Trade Minister, recently stated that he expected to announce Canada's programme for the development of nuclear generated power in the not too distant future.

### Idea for Diesels

With the idea of meeting peak load and emergency power demands the Quebec Hydro undertaking is trying out a plan at Rimouski, using a mobile diesel generator, which is remote controlled. It has been claimed that the diesel plant can assist in meeting a demand which in many cities and industrial towns probably occurs for as few as 30 hours during the three winter months. To provide permanent plant capable of meeting that load would be illogical, it is maintained. The idea put forward by the diesel generator makers is that mobile plant could feed into the heavily loaded systems as required, and for the remainder of the year used in out-of-the-way places where power is needed quickly for a short time.

## U.S.A.

### St. Lawrence Plant

The contract for sixteen generators for the American section of the St. Lawrence River power project, has been placed with the General Electric of America by the New York State Power Authority. The latter stated that G. E. was the lowest bidder for the twelve sets, although the Swiss firm of Brown Boveri submitted a low tender for four units. The Authority placed the contract after taking into consideration "all factors, including uniformity of design, minimum of spare parts, proximity of manufacture to the site, availability of engineers and skilled labour." We noted on 3 Feb. that an order for eight hydraulic turbines had been given to Allis-Chalmers Manufacturing Co.

### Nuclear Power

The first nuclear generated power for commercial use in the United States would probably be available by late summer or autumn, it is reported from Washington. The plant is installed at West Milton, New York, and will be operated by the General Electric. Its capacity is put at 10,000 kW.

## EUROPE

### Paris-Rome Line

Express trains between Paris and Rome are now hauled electrically throughout with the completion last weekend of electrification of the 20-mile section of line between Macon and Bourg. This latter section links the recently electrified Paris-Dijon-Lyon main line with the hydro-electric systems already operating in the French Alps.

### Reparations in Kind

Agreement has now been reached in the Yugoslav-Italian financial negotiations concerning reparations and property compensations. Under these, Italy has agreed to pay to Yugoslavia the equivalent of U.S. $30 millions over the next three years, but more than half this amount will be provided in the form of electrical plant. Of the total, equipment will be supplied for three thermal power stations and one hydro-electric station, to a value of $16 millions, in addition to h.t. transmission line equipment and transformer station plant valued at $1 million.

## AFRICA

### Line Completed

The 132 kV transmission lines which have been built to carry power from Owen Falls to Kampala and Tororo, for the Uganda Electricity Board have been completed. The final stages were witnessed by Sir Charles Westlake, chairman of the Board and members of the Board's staff. The lines are 114 miles in route length, being the first stage in the development of a grid transmission system for Uganda. Although it is barely 16 months since the first of the 552 steel towers were erected, the lines are now complete and operating at 33 kV. Later this year they will be operating at 132 kV. Contractors for the lines are British Insulated Callender's Construction Co. Ltd.

### Go Ahead on Kariba

The Central African Federal Government is to proceed with the Kariba Gorge hydro-electric scheme on the Zambesi, in preference to the Kafue project. Announcing this last week, Sir Godfrey Huggins, Prime Minister, said that they had to consider not one hydro-electric scheme in isolation, but a major decision of policy by switching reliance in the Federation from thermal to hydro-electric power. Looked at from that angle, the first stage of the Kafue project was too small and would be inadequate before 1963, and even with the second stage it would be too small for 1964. The Kariba scheme, however, used the Zambesi, the flow of which had been measured and recorded for many years. One of its big advantages was that after the first stage was completed and a dam built, the power output would be increased merely by adding generating sets at a comparatively reasonable cost. The calculations of the cost of power produced were also in favour of the Kariba project. The Government hoped to substantially reduce the time of construction from the original estimate, and experts considered it feasible to provide the copper belt with additional power from Umniati, Southern Rhodesia, to carry them over the period till Kariba was in operation. Sir Godfrey added that the president of the International Bank had been invited to send a mission to investigate the Kariba project. Finance needed for construction of the dam, with six sets installed, was estimated at £54

millions, of which the Federation would contribute £8 millions. (Salient features of the Kariba and Kafue schemes were given in our issue of 20 Jan. This showed the ultimate capacity of Kariba as 1,232 MW, with sixteen sets, while that of Kafue would be 768 MW with eight 75 MW and four 42 MW sets). Sir Godfrey's announcement has drawn support from some quarters and opposition from others. In the latter group, Mr J. H. Lascelles, executive vice-president, Rhodesian Selection Trust, favours the Kafue scheme.

## INDIA

### Madras Scheme

Work on the Periyar hydro-electric project, South India, has been inaugurated by the chief minister of Madras. This new scheme will ultimately provide 140 MW during the June to Feb. period and about 44 MW from Mar. to May. The project is scheduled to be completed in four years. It involves the construction of a dam 158 ft high, to form an artificial lake of 15,662 million cu ft capacity. The catchment area of nearly 240 sq miles has an average annual rainfall of 100 in. The scheme provides for utilising a continuous discharge of 1,000 cu secs during irrigation season (June to Mar.) and 300 cu secs from Mar. to May during the period of irrigation closure. With the completion of this project, Madras State will have almost reached the limit of its water resources for power development. Apart from the Kundah project, now awaiting sanction from the Planning Commission the State has no other recognised water power source.

### More Hydro

The first hydro-electric station in the State of Nizamsagar, India, was recently put into operation by the Public Works Minister, Dr G. S. Melkote. At the moment only one 5,000 kW generating set is running but two more similar units are to be in commission soon. The station constitutes the first phase of power development on the Majira River, a tributary of the Godavari. The Devanpur project is the next development. Output of the station is transmitted to Hyderabad city by means of a 64-mile long double-circuit line. Until now, Hyderabad city has depended on a thermal station for its supply.

## AUSTRALIA

### Tennyson Extension

Plans are being prepared for a further extension of the Tennyson power station of the Brisbane City Council, Alderman Dower, chairman of the Transport and Electricity Committee, has stated. This provides for a further 30 MW turbine, with two boilers, to be in operation in about six years time. This would raise the capacity of the station to 150 MW.

## NEW ZEALAND

### Economy Urged

Saying that power cuts were intolerable and unnecessary, Mr A. E. Davenport, general manager of the New Zealand State Hydro-Electric Department, has told representatives of the South Island power supply authorities that individual consumers would have to economise. He was referring to the present serious water storage position. He considered that cutting off power was not the proper method where the shortage was likely to extend over more than a few weeks. It was necessary to have an individual allocation if reasonable economy was to be exercised. Of South Island power, 62% was used in homes, 32% in domestic water heating, he added. Mr Davenport believes there is a possibility that the Roxburgh hydro-electric scheme will be operating next winter—the contractors could claim an additional £1,000 for each day they finished ahead of contract time. On the possible shelving of the Braeburn scheme he said no decision had been reached. He would report to the Government, which would decide, but he made it plain that if the scheme was shelved it would be for economic reasons. The cost of the Cobb scheme worked out between £140 and £150 per kW. Roxburgh figures would be between £70 and £80, and the average cost for the entire South Island system when completed would be about £60. Mr Davenport said the Braeburn scheme should work out at a price similar to that for the Cobb project. Was it right that they should go on with these schemes at this juncture when there were others that could be developed at less cost, he asked?

### Peak Control Improves Finances

Water heater controlling equipment for use at peak load times, has saved the Auckland Electric Power Board £118,000 in six months, it was stated at last month's meeting of the Board. At that meeting, Mr N. M. Speer, general manager, told members that the Board's net surplus for the nine months ended 31 Dec. last was £58,719, and the estimated surplus for the full financial year was £39,448—much more than was expected.

*Work is pushing ahead on the New Zealand's Atiamuri hydro-electric station on the Waikato River, North Island, the perspective drawing of which is reproduced below. Planned for a capacity of 63 MW, orders have been placed with the English Electric Co. Ltd., for three 21 MW Francis type turbines and with A.S.E.A. of Sweden for the generators. Consulting engineers for the project, for the New Zealand Ministry of Works, are Sir Alexander Gibb and Partners. The dam is to be 125 ft high and 570 ft long, flanked by an earth embankment. Normal operating head will be 83 ft. The power house is to be built in the former river gorge immediately downstream from the dam. Atiamuri, which, it is hoped will be completed in about three years time, will be the fifth in the chain of major power stations on the Waikato River between Taupo and the sea, the others being Arapuni, Karapiro and Maraetai, which are in operation, and Whakamaru, now nearing completion*

# Personalities

## IN THE INDUSTRY

Appointed general manager of the Electricity Trust of South Australia is **Mr C. R. Colyer,** who was formerly the assistant general manager. He succeeds the late Mr R. H. M. Lea. Mr Colyer began his career with the former Adelaide Electric Supply Co., Ltd., as a junior clerk, and when the Electricity Trust took over the undertaking he became assistant to the secretary. He was appointed assistant to the manager in 1950 and assistant general manager three years later.

**Mr J. Calvert** has been promoted to station shift control engineer at Padiham power station, North West, Merseyside and North Wales Division, B.E.A.

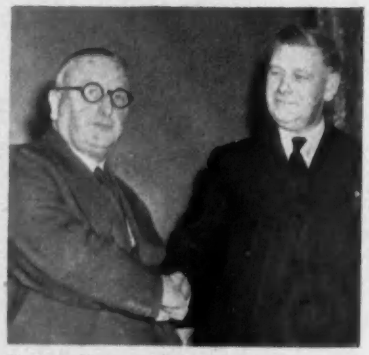
Management changes at the Willesden Works of the British Thomson-Houston Co., Ltd., have just been announced by the company. **Mr E. Alexander,** A.M.I.E.E., A.M.I.PROD.E., has been appointed manager of the Willesden Works in succession to **Mr H. E. Cox,** who, as already noted, is now manager of the company's Rugby Works; **Mr C. F. Humphreys,** A.M.I.E.E., A.M.AMER.I.E.E., formerly engineering superintendent, becomes manager, Switchgear-Engineering Department, and **Dr J. R. Mortlock,** PH.D., B.SC.(ENG.), M.I.E.E., is appointed manager, Power-System-Engineering Department. Mr Alexander received early training at Regent Street Polytechnic and joined B.T.H. as an electrical tester at Willesden Works in 1924 but in 1925 entered upon a student apprenticeship, with subsequent training at Rugby, and Birmingham works. In 1930 he returned to Willesden as experimental engineer, later becoming switchgear service engineer with added responsibilities of chief inspector. Mr Alexander was appointed factory superintendent at Willesden in 1937, and general superintendent in 1946. Mr Humphreys also received early training at Regent Street Polytechnic and joined B.T.H. as an engineering apprentice at Rugby in 1920, transferring to Willesden Engineering Department in 1924. After service as a section leader on e.h.t. switchgear layout, he was appointed layout engineer in 1936. Two years later he became deputy superintendent engineer and in 1946 assumed the responsibilities of superintendent engineer. Dr Mortlock, who is well known for his work on network analysers, was born in Quetta, India, and educated at St. Joseph College, Nairi Tal. He commenced his technical education at Finsbury Technical College in 1921, joining B.T.H. as a student apprentice in 1924. He transferred to Tender Engineering Department in 1928, but three years later was appointed assistant to superintendent engineer. On the formation of the Power System Engineering Department, Dr Mortlock became its chief engineer, remaining in that position until his present appointment.

In view of the growing industrial importance to the world of Middle Eastern countries, **Mr D. S. Barwell,** sales promotion manager (Export) of Johnson and Phillips Ltd., has left for a tour which will embrace Iran, Iraq, Kuwait, Syria, the Lebanon, Cyprus and Turkey.

**Air Marshal Sir Victor Goddard,** K.C.B., C.B.E., has joined Elliott Brothers (London) Ltd., as an assistant (air) to the managing director.

The B.B.C. announces the appointment of **Mr W. R. Fletcher,** B.SC.(ENG.), A.M.I.E.E., as engineer-in-charge at the Brookmans Park transmitting station. Mr Fletcher joined the B.B.C. in 1936 as an assistant maintenance engineer at the Lisnagarvey (Northern Ireland) transmitting station. He has served at a number of the Corporation's transmitting stations, and in 1944 became a senior maintenance engineer at the B.B.C.'s overseas transmitting station at Rampisham, Dorset. In 1949, he was seconded as chief engineer of the Ceylon Government Broadcasting Service, in which post he remained until 1951 when he was appointed resident engineer of the British Far Eastern Broadcasting Service at Singapore. In his new post, Mr Fletcher succeeds **Mr D. Hamilton-Schaschke,** who has become resident engineer, British Far Eastern Broadcasting Service, Singapore.

**Mr W. J. Dixon,** M.B.E., chief of the Technical Cost Department, Automatic Telephone and Electric Co., Ltd., Liverpool, has retired after 55 years' service with the company. Since Mr Dixon's first installation job in Glasgow in 1901, he has travelled extensively throughout the world in the course of his career. For the past 30 years, he has specialised in contract pricing for supply agreements with the B.P.O. and overseas telephone administrations. He received the M.B.E. last year.



*Mr J. A. Mason, right, director and manager, Automatic Telephone and Electric Co., congratulates Mr W. J. Dixon*

**Professor T. U. Matthews** is resigning from the Lucas chair of Engineering Production at Birmingham University with effect from 15 Aug. next.

**Mr C. E. D. Catley** has just arrived in Canada where he will superintend the setting up of a pilot plant for the manufacture of Hellerman sleeves and cable markers and other products made by the group. A new company, Hellerman (Canada) Ltd., is in course of formation.

Appointed as assistant to the general manager and chief engineer of the British Columbia Power Commission is **Mr G. Griffiths.** He will work with **Mr H. L. Briggs** who became the Commission's first general manager last month. Mr Griffiths is an electrical engineering graduate of the University of British Columbia, and, after war service, joined the Commission in 1946. Since then he

*Dr J. R. Mortlock*

*Mr C. F. Humphreys*

*Mr E. Alexander*

Mr D. R. Davies

Mr F. Bateman

Mr R. F. Marshall

Mr R. H. Steeds

has successively held the posts of power district supervisor, assistant interior region superintendent, coastal region superintendent, deputy chief engineer and distribution superintendent. His successor as distribution superintendent is **Mr J. N. Olsen,** previously manager of the Comox Valley and Campbell River power districts.

New assistant managers of the Education Department of the Metropolitan-Vickers Electrical Co., Ltd., are **Mr F. Bateman** and **Mr R. F. Marshall,** B.SC.(ENG.), A.M.I.MECH.E., picture below. They are both responsible to **Mr K. R. Evans,** manager of the Education Dept. —Mr Bateman for trade apprentice recruitment and training, and Mr Marshall for professional apprentice recruitment and training and military service matters. Mr Bateman went to Trafford Park as a probationary trade apprentice with the then British Westinghouse Co. in 1918, and joined the staff of the Education Department in 1927, since when he has been entirely connected with the training of apprentices. He is also actively associated with school governing bodies and a member of committees dealing with apprentices. Mr Marshall went to M.-V. as a college apprentice in 1936 and joined the Education Dept. staff in 1940 as technical assistant dealing with professional engineering grades. In 1951 he was appointed section leader, Professional Engineering Training. Mr Marshall is also a member of various committees dealing with education. He is chairman of the Manchester and District Group of B.A.C.I.E., and a member of the Institute of Personnel Management.

**Mr D. R. Davies,** M.I.E.E., switchgear engineering department, has been appointed consulting designer, Metropolitan-Vickers Electrical Co., Ltd. He joined the company (then British Westinghouse) as an apprentice in 1906. For many years he has been the chief metal-clad switchgear designer at Trafford Pk, and his numerous patents include several of outstanding importance, particularly in the field of high voltage switchgear for large power stations. During the last war he was engaged on the design of equipment for the services.

The new general manager of the Winnipeg City Hydro-electricity undertaking is **Mr T. Storey,** who has been assistant manager since January, 1952. Earlier he had been chief engineer for four years, after a similar period as general superintendent in charge of production. He started with the City Hydro in August, 1929. Mr Storey is also president of the Manitoba Electrical Association.

**Mr W. J. Dimmock** has joined the board of Hoover Washing Machines Ltd. He has been works manager of the Perivale factory since 1951, and was a member of the specialist team on mechanical aids, sponsored by the Anglo-American Council on Productivity, which went to America in Sept., 1949.

British Insulated Callender's Cables Ltd. announce the appointment of **Mr R. H. Steeds** as regional manager (Scotland). He will work from their Glasgow office. Educated at Bristol Cathedral School and Merchant Venturers' Technical College, Bristol, Mr Steeds served his electrical engineering apprenticeship with Rouch and Penney, of Bristol and afterwards became traction sales engineer with Brecknell Willis and Co., Ltd. He was later appointed their traction sales manager for the North of England and Scotland. He joined B.I.C.C. in 1945 as sales engineer, Traction Department, and in 1952 was made assistant sales manager, Traction, a position which he held until his present appointment.

The Minister of Fuel and Power has re-appointed **Mr C. R. Heathcock,** F.C.I.S., and **Mr J. McDowall,** as part-time members of the Midlands Electricity Board.

**Mr A. E. Wilbraham** has resigned from the board of Taylor Tunnicliff (Electrical Industries). **Mr L. H. Jones** and **Mr J. F. Moxon** have been elected directors of that company.

**Mr G. W. Garth,** A.M.I.E.E., senior assistant engineer in the Generation (Operation) Department of the North West, Merseyside and North Wales Division, B.E.A., at Liverpool, has been appointed deputy superintendent at Agecroft "B" power station. From 1948 to 1952 Mr Garth was system operation liaison engineer with the former Merseyside Division, and for two years previously was control engineer at Birmingham-Central Electricity Board. He also served with the Bradford Corporation undertaking as switchboard attendant and control engineer.

Enfield Cables Ltd. announce that **Mr R. A. Kirby,** A.I.R.I., has relinquished his position as works manager of their Rubber and Plastics Cable Factories, in order to take up an appointment with their subsidiary company, Enfield Cables (Australia) Pty. Ltd. He will be sailing with his wife and family to Sydney on 5 April. **Mr H. E. Tickner,** A.M.I.PROD.E., A.M.I.I.A., who was formerly in charge of the Paper Cable Factory only, has now been appointed works manager—cables, in charge of all three cable making works. Mr Tickner has completed 32 years' continuous service with the company and has held office for six years as chairman of the Central Regional Council of the A.S.E.E. He is a director of Electrical Engineers (A.S.E.E.) Exhibition Ltd., who are responsible for the current Exhibition at Earls Court. The company's subsidiary cotton covering factory at Blaenavon, Wales, has been closed down and this production has been transferred to the main works at Brimsdown. **Mr W. G. Turner,** who was in charge of the Blaenavon factory, has been appointed manager—Covered Wires Department at Brimsdown, and has assumed responsibility for the production of all covered wires and strips.

The annual Ladies' Night held by the Ipswich and District Electrical Association at Colchester recently, was attended by over 220 people. Our photograph alongside, shows the chairman and his wife, **Mr** and **Mrs H. E. Wright,** greeting **Mr** and **Mrs H. B. Campbell.** Following the reception, and the dinner, dancing completed a highly enjoyable evening.

At I.D.E.A.'s Ladies' Night

## OBITUARY

**Mr C. M. Mayson,** M.I.E.E., who was stations engineer to the former Charing Cross Electricity Supply Co., Ltd., for 38 years, died on 1 Mar., aged 82. He served an apprenticeship in St. Rollox locomotive works of the Caledonian Railway Co., Glasgow., and after technical training at the Central Institution under Professors Ayrton, Unwin, Armstrong and Henrici, was electrical engineer to Whitehaven Corporation for three years. He became stations engineer to the Charing Cross Co. in 1899, holding that position until retiring in May, 1937. He was also president of the Diesel Engine Users' Association in 1933/34.

**Mr A. Sinclair,** a director, and general manager of the Craigpark Electric Cable Co., Ltd., died on 1 Mar., aged 61. He had been with the company over 44 years, having served as secretary prior to his election to the board in 1948.

**Mr A. Cartwright,** who served for 30 years with the former Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board, and the B.E.A. at Hartshead power station, died on 1 Mar., aged 61.

**Mr E. J. H. Bluett,** A.M.I.E.E., who operated on his own account in North Devon some years ago, died on 1 Mar.

**Mr W. J. H. Wood,** M.I.E.E., M.I.MECH.E., who died on 2 Mar., aged 77, had a long and distinguished association with London's electricity supply industry. He was a part-time member of the London Electricity Board until the end of 1953, but he became prominently known throughout the industry as engineer-in-chief of the County of London Electric Supply Co. from 1925 to 1945, after which he was joint general manager of the company until vesting day. He was also a director of the County of London Co. and the Kent Electric Power Co. Earlier he had been borough electrical engineer and manager at Bolton from 1913 to 1927, after serving with that undertaking as assistant engineer from 1900, and obtaining previous experience with the Edinburgh Corporation undertaking and in Antwerp, in which city he was born. A memorial service to Mr Wood is to be held on 11 Mar. at 12.15 p.m. at St Michael's Church, Cornhill, E.C.3.

*Mr W. J. H. Wood*

**Mr G. T. Perkins,** technical sales manager, and **Mr L. R. Langmead,** technical service manager to Smiths Aircraft Instruments Ltd., died on 28 Feb., as the result of a road accident.

**Mr F. G. Connor,** B.SC.(ENG.), A.M.I.E.E., managing director, Metallurgical Equipment Export Co., Ltd., died recently in Venezuela.

# NEW LITERATURE

### *Electro-plating and Corrosion Prevention*

*Edited by E. Molloy*

ELECTRO-PLATING, which was originally introduced as a means of applying a deposit of nickel, gold or silver as a decorative finish to jewelry, cutlery and other such articles has since been developed to such an extent that there is hardly a branch of industry which does not make use of the process. With the increase of its use the technique has advanced considerably and it is the purpose of this book to provide a comprehensive guide for all those engaged in modern plating practice and corrosion inhibiting methods.

The book opens with a discussion of the principles of plating with particular emphasis on the electrical plant, then cleaning, pickling and dipping are considered in detail. The usual plating metals such as chrome, nickel and copper are discussed and the recently introduced tin-alloy plating metals are given particularly detailed treatment.

Parkerising and Sherardising, two proprietary methods of corrosive protection and metal spraying techniques are then described. This book is mainly written from a practical point of view and details of working temperature and electrolyte quantities are given for most kinds of work. It should prove of interest to all concerned with plating. Published by Geo. Newnes Ltd., 276 pages, 8¼ in. by 5¼ in. Price 18s.

### *Elements of Electricity*

*by W. H. Timbie and A. Kusko*

THE writing of an elementary text book presents the author with a formidable task. This is particularly so when electricity and magnetism is the subject, as a thorough knowledge of fundamentals presupposes a comparatively advanced mathematical ability. To steer the course between introducing electron mechanics as a starting point, or reliance on parrot-wise learning of sets of formulæ is a problem which has been attacked on numerous occasions with varying success. One of the earliest, and one of the more rational books accepting restricted mathematical and theoretical limitations was Timbie's Elements of Electricity first published in 1910. This, the fourth edition, has lost none of the clarity of exposition of its predecessors, although it has undergone extensive revision and addition in the light of recent developments and techniques. The text is restricted to an adequate treatment of a few fundamental ideas rather than a discursive attack on many. Thus it includes only the elementary principles of direct and alternating current generation, distribution and utilisation of light and power, and communication. Throughout the accent is eminently practical, and the book provides a solid foundation on which more advanced courses of electrical technology can readily be built. Published by Chapman and Hall, 631 pages, 5¼ in. by 8¼ in. Price 44s.

### *Electric Wiring—Theory and Practice*

*Revised by C. R. Urwin, W. F. Parker and F. G. Thompson*

THIS is the ninth edition of Ibbetson's well-known book on electric wiring and has undergone a most extensive revision to bring it in to line with new systems and materials. As its title suggests it is essentially a book for the practical man who is concerned either with the design or with the installation of wiring systems for domestic, office or factory use. The text covers such items as current calculations, power factor, diversity, wiring systems for light and power distribution, simple communication systems, testing, illumination, small generating plant and motors. Most of the answers to the wireman's—and the student's—technical problems will be found in the book. Published by E. and F. N. Spon Ltd., 296 pages, 4¼ in by 7¼ in. Price 11s. 6d.

## BOOKS RECEIVED

**Micrometer, Slide Gauges and Calipers** by Alfred W. Marshall and George Gentry, has now been reprinted. It deals with verniers, calipers and micrometers of various types, giving detailed information on construction. Published by Percival Marshall and Co. Ltd., 78 pages, 7¼ in. by 5 in. Price 3s.

**Gas Turbine Principles and Practice,** Consulting Editor, Sir Harold Roxbee Cox, contains the accumulated experience of over 20 of the leading authorities on gas turbine theory and practice. Published by Geo. Newnes Ltd., 960 pages, 8¼ in. by 5¼ in. Price 90s.

**Fundamentals of Electricity** by Wynne L. Mc. Dougal, Richard R. Ramson, Carl H. Dunlap, revised by Kennard C. Graham. Relates practice with theory right from the outset, and is described as being an illustrated explanation of electrical principles. Third edition (revised). Published by the American Technical Society, distributed by Technical Press Ltd., London, S.W.3, 415 pages, 8¼ in. by 5¼ in. Price 28s.

**Blueprint Reading for the Machine Trades** by Robert H. Fortman and James McKinney, answers all the questions on American draughting technique for both draughtsmen and machine operators. Second edition (revised). Published by the American Technical Society; distributed by Technical Press Ltd., London, S.W.3, 121 pages, 8¼ in. by 5¼ in. Price 38s.

**Fundamentals of Transitors,** by L. F. Krugman. Designed primarily for technician and amateur, and should serve initial needs of student and engineer. Published by Chapman and Hall, 140 pages, 8 in. by 5¼ in. Price 21s.

# PROBLEMS AND PRACTICE

## In Engineering

### Slipping Clutch

REPEATED driving end bearing failure had been experienced on a 10 h.p., screen protected, motor and in each case, when the bearing was replaced, it was noticed that the motor shaft extension showed evidence of overheating. The bearing grease had also liquefied and escaped from the bearing housing with the result that the bearing had been running dry and causing cage wear.

The user reported that load readings had been taken which indicated that the motor was not overloaded although it was felt that the motor "slowed up" when the driven machine was run at full load. As the motor tested satisfactorily after fitting a new bearing it was decided to investigate site conditions. The reason for the trouble was soon apparent and was located in a clutch mounted on the motor shaft.

The clutch was badly adjusted and, with the driven machine on light load, slight slipping of the clutch occurred, which increased with the load, the resultant overheating of the clutch being transmitted to the motor shaft and bearing. With correct adjustment no more trouble was experienced.—*"Torque."*

### Installation Earthing

I FULLY agree with your correspondent, Mr R. H. G. Holloway, in his remarks on Installation Earthing in the 24 Feb. issue, and particularly note his use of the plural when he advocates the earthing of installation at its extremities. When I was an apprentice, it was impressed upon me that every installation should be earthed in at least two places, at the extreme ends, so that in the event of a fracture occurring, the part remaining alive would still be earthed. Most specifications carried this instruction.

Where the water main is used for earthing, the connection should be made to the rising main at its lowest point, as this is seldom altered by the plumber unless major alterations are proposed, in which case, an electrician is usually called in for other work. The plumber is not always to blame, as the earth connection is often at some remote point, and an alteration to the plumbing arrangements results in the failure of the earthing system and, of course, it is not revealed until a fault occurs. The following incident illustrates this.

I received a call from a block of offices quite near to our office, to the effect that the comptometer machine was giving shocks. I immediately went to investigate, taking a "Megger" insulation tester and neon tester. The installation consisted of a separate circuit in conduit terminating at a 15 A switch plug. An insulation test of the machine and circuit revealed no fault, and all connections were correct. I made a physical check of the earthing, and this appeared in good order and terminated in a good connection to the cold water tap in a wash basin. I arranged to make a second visit with an earth tester. I had only arrived back at our office when a call came that the machine was again alive, although not switched on. I immediately returned, and this time the machine, installation and earth wire were all alive. Even after removing the plug the installation remained alive. I was surprised to find the water tap alive, and then I found out that this tap was not in use.

Tracing this pipe back, I found it had been cut off at some time previously. A second earth wire was connected to the same pipe, and this was traced to another office which was used at infrequent intervals. An electric fire in this office was found to have a defective switch controlling the second element, so of course as soon as this fire was switched on, the fault was applied to the whole installation. In these days of ring main systems, a sound *permanent* earth is of vital importance, as any earth fault occurring in one part of the system is applied to all apparatus on that system should the earthing be defective.—*W. T. Wedlake.*

* * *

I READ with great interest the note headed "Installation Earthing," in 24 Feb. issue, by Mr R. H. G. Holloway and would endorse his remarks with regard to every installation being earthed at its extremities. May I say that this is good practice (although in some cases it may be an absolute necessity in order to conform to Rule 1003A of the I.E.E. Regulations).

However, I feel that it is more important (provided it suitably complies and fulfils the required conditions in the prevailing circumstances) to connect the earth continuity conductor from the "mains" position to the rising water-main, and this will also be in strict compliance with Regulation 1007A.

I say, therefore, that a periodical test and inspection would cater for this situation as described by Mr R. H. G. Holloway, and advocated by myself in "Readers' Views," 5 Aug., 1954, issue of the ELECTRICAL TIMES. In conclusion, may I say that I would very much like to see Regulation 4: "Instructions for periodical inspection and testing" put into operation as soon as possible. The notice itself requires only the alteration of the word "should . . ." to "must be periodically inspected and tested to be effective." —*J. H. Robinson.*

*Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.*

### Latent Iron

THE location and repair of intermittent and obscure faults on electrical installations and equipment is probably the more difficult side of the contracting electricians work, and when the human element creeps in the difficulties are at times wellnigh insuperable. The following account is a fair example of what one has to contend with.

Having completed the re-wiring of a small residential hotel, carried out the usual tests, and obtained a meter connection, I was rather surprised to hear that a section of lights were out. The cause was soon apparent, one of the circuit fuses having blown, but intensive tests and inspection failed to reveal any cause and I had to leave it unexplained. A few days later the same thing occurred and still no cause could be found. All appliances that the residents admitted using were in good condition and no fault on the wiring had come to light.

On the third occasion of the fuse blowing the manager of the hotel was becoming somewhat irate and insisted that the fault be found "or else." After spending another fruitless hour checking the circuit, much to the annoyance of the residents (mainly elderly people having their afternoon nap), I had got to the point where I was almost ready to admit myself beaten. The only possible course left was that a resident must have a faulty appliance that had not been produced.

Thinking along these lines, it occurred to me that one elderly lady had a few washed garments drying around her fire and yet had no electric iron. Having a rather suspicious mind, it appeared to me that perhaps this member of the fair sex was not quite truthful. After checking with the manager that the lady did not borrow an iron from him, I decided to use shock tactics and informed the resident (quite untruthfully) that I had traced the fault to her room and that it was probably in her electric iron. Fortunately for me, the lady was so startled that she produced her iron without demur and the fault was soon apparent—a loose element tag shorting out inside the cover. After repairing the iron, I gave the manager the details and joyfully departed. This incident shows the need for an open mind when fault finding.—*W. Satchwill.*

# Equipment for Industry

## Wide-Range Automatic Timer

TO meet the demand for a compact process or interval timer, suitable for panel mounting, LONDEX LTD., Anerley Works, 207 Anerley Rd, London, S.E.20, have produced a new instrument the type R.F.T. The instrument consists essentially of a synchronous motor, which runs continuously, an electric clutch operated by a push-button on the front, and a timing cam which controls the contacts. Time setting is effected by turning a knob directly coupled to both the timing cam and an indicating pointer. When the clutch is energised, the motor takes over, bringing the cam back to the zero position at which point it makes or breaks the contacts.

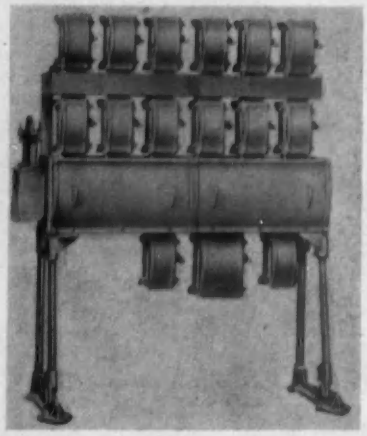
A particular advantage claimed for this instrument is the variety of contact arrangements that can be provided. Up to two sets of normally-open and normally-closed contacts can be accommodated and these can be arranged to operate at the beginning and end of the timing interval, alternatively when delayed make or break is required, up to two sets of contacts can be incorporated. The silver contacts are rated at 500 VA.

A wide range of standard instruments is manufactured and these are suitable for various timings according to their scales. The lowest in the range caters for maximum setting of 10 seconds whereas at the other end of the scale, a maximum of 72 hours is possible. In order to prevent unauthorised interference with the time setting, the knob may be replaced by a key-operated mechanism; this being an extra on the basic price of £18. 10s. 0d.

*This timer is suitable for panel mounting. The synchronous motor drive takes only 2 VA*

## Weatherproof Switchgear Range

A NEW range of switchgear has recently been introduced by SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, Birmingham. This gear, which is widely used for general industrial purposes and m.v. distribution, comprises the familiar pedestal mounted busbar chamber with switch-fuses mounted above and below. A distinctive feature of this "Regent" switchgear, however, is that it is suitable for outdoor use. In addition, the novel double-tier arrangement of switch-fuses, clearly shown in the illustration, greatly increases the number of outgoing ways for the busbar length.



*This illustration shows the novel arrangement of switch-fuses in double tiers*

Four standard lengths of busbar chamber are available, all can accommodate the highest rating busbar of 800 A and are readily extensible. The switch-fuses are made in four standard ratings from 15 to 100 A and incorporate either rewirable or h.r.c. fuses. With the exception of the 15 A unit all units are suitable for use at 660 V.

The gear has been A.S.T.A. tested for closing on to a fault of 35 MVA and after replacement of fuses, the same arrangement of units is claimed to have been satisfactorily tested on "make and break" tests as specified in B.S.861.

## Silicone Rubber Tape

A NEW winding tape now available to manufacturers and repairers of transformers and rotating machinery, will permit much higher running temperatures by virtue of its resistance to heat. With a working temperature range from −50° to +250°C, it far exceeds the performance of other insulating tapes and should assist manufacturers in reducing the size of equipment. The tape consists of a woven glass cloth covered with silicone rubber and the result gives an excellent insulating material which should find application to field coils, armatures and transformer windings. The new tape is available from DUNLOP LTD., Hastings Hse, 10 Norfolk St, W.C.2.

## Automatic Humidity Cabinet

IN various Government specifications covering performance of small electrical components, temperature and humidity cycles are laid down to ensure equipment will withstand onerous service conditions. An apparatus specially designed to apply such cycles is manufactured by HEDIN LTD., Commerce Estate, South Woodford, London, E.18.

The equipment comprises a humidity chamber mounted on a lower compartment which houses all controls. The fibreglass insulated humidity chamber has a stainless steel lining and is supplied with circulating air from a blower mounted below. The temperature and humidity of the cabinet air may be set on the control cabinet and are maintained automatically enabling a complete test to be performed without constant supervision. Monel encased heaters in the airstream give an air temperature of between 20° and 100° C and are maintained at a setting by a capillary type indicating controller. Similarly humidity may be fixed between 20 and 95% R.H. and is maintained by an automatic magnetic valve and level in conjunction with a humidifier. All metal used in the humidity chamber and air circulating system is either stainless steel or non-corrosive alloy to minimise the effects of the humid atmosphere.

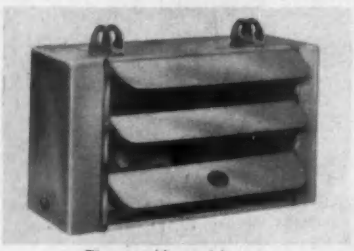
Illumination of the interior of the chamber is provided by a hermetically sealed lamp unit; a large double walled armour plate glass panel in the door permits viewing components on test. Condensation on the glass has been eliminated by provision of a heater placed between the two glass layers.

*Humidity cabinets such as above are employed for testing small components built to comply with Ministry specifications*

## Improved Hurseal Unit Heater

IMPROVED dual purpose electric unit heater has been announced by HURSEAL LTD., 229 Regent St, W.1, for use in factories, warehouses and other space heating applications.

Elements have been arranged in a mat pattern to provide an even temperature rise for the whole of the air passing through the unit. The fan in the unit can be arranged to operate independently to provide ventilation only. For this a short duct can be fitted from the rear of the heater to the outside air. Adjustable



*The new Hurseal heater*

louvres provide air stream control and all units have a safety cut-out and safety mesh guard.

Three heat or thermostatic control can be fitted if required to give maximum economy of operation and prices range from £15. 7s. 6d. 2·625 kW to £20. 17s. 6d. 5·25 kW and £32. 19s. 6d. for the 10·5 kW model Special types are available for d.c. supplies.

## Price Increases

DUE mainly to increased prices of materials, a number of price increases have been announced by THE POWER CENTRE CO., LTD., Lloyd St, Wednesbury, Staffs. As from 1 Mar., 1955, the following prices apply:

Trunking fittings, Leaflet SCT 1 Pages 6, 7 and 8 Cast type only +150%

Busbar chambers, Leaflet BC1, Page 2 +75%

Circuit clamps, Leaflet BC1, Page 3 +160%.

Cable sealing boxes, Leaflet CB1 +170%.

MIDLAND ELECTRIC MFG. CO., LTD., Tyseley, Birmingham, have also increased by 5% the prices of all equipment in their current catalogues covering switch and fusegear, motor control gear and electrical accessories. The increase is operative as from 1 Mar., 1955, and will be shown as a 5% surcharge upon invoices issued from that date.

## "Stop Press" Window Sales Aid

VALUABLE sales aid now available is the "Presgrip" interchangeable window showcard produced by THE PRESGRIP SIGN CO., 55a Eastgate St, Winchester, Hants.

This comprises a sheet of red or black p.v.c. mounted in a 1¼ in. wide frame of

*Up-to-date sales messages are easily made with the "Presgrip" unit*

cardboard coloured grey and relieved by thin blue and yellow lines. Letters of rigid white plastic are applied to the surface by slight pressure with the thumb. They "stay put" without any adhesive and are easily removed.

A complete set comprising one showcard (9½ in. x 11 in.) and 118 letters (¼ in. high and ¼ in. thick) costs 32s. 6d. Numerals and money symbols can be added to the set as an extra at 10s.

## "Gearless" Fluo Range Extended

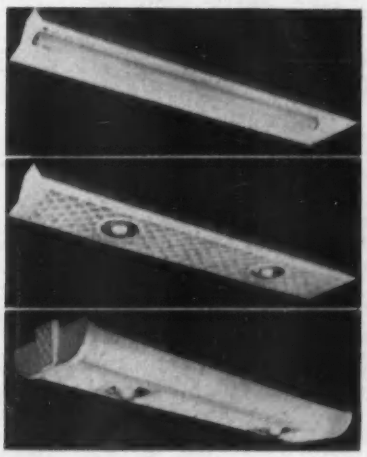
FOUR additions to the range of "Gearless" fluorescent lighting fittings have been made by PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Ave, W.C.2.

The Avon (A.6200) is for two 40 W 4 ft fluorescent lamps and two tungsten ballast lamps. It is a commercial fitting and is intended either for rod or chain mounting. List price is £8. 16s. plus £1. 13s. The "Avalon" (A6206) is exactly the same fitting but is designed for close ceiling mounting and includes a mounting channel for that purpose. Price is £9. 9s. plus £1. 15s. 5d. Both fittings have metal frames enclosing the side panels which together with the whole louvre frame and its ballast lamp reflectors are completely detachable.

# *For the Electrical Trade*

The Amsterdam (A6208) is a closed end trough reflector fitting specially designed for industrial use and is, therefore, not subject to purchase tax. It is stove-enamelled grey outside and white inside and is for two 40 W 4 ft fluorescent lamps. Whilst not built to house tungsten ballast lamps there is provision for remote operation where required. This fitting may be used with a standard louvre frame (A6260) but it is not available with upward light slots. Price £5. 4s. 6d. The "Amersham" (A6209) is another industrial fitting which is a variation of the closed end trough reflector fitting for recessed or pendant mounting. Two tungsten balast lamps are set towards the centre and reflectors for these are assembled as an integral part of the louvre frame which is detachable. Price is £9. 7s.

The type A6210 tungsten ballast lamp reflector is a fully recessed sheet steel housing for use with ballast lamps not embodied in the fittings. External finish is white body brown stove enamel. It is designed for use mainly with the "Amsterdam" reflector and costs £1. 4s. 6d.



*Top to bottom: The Avon, Avalon and Amsterdam fittings now in Philip's Gearless range*

## TRADE PUBLICATIONS

PLASTICS.—Booklet issued by British Geon Ltd., Devonshire Hse, Piccadilly, W.1, describes the uses of Geon Polyvinyl materials.

COMPONENTS.—Latest complete catalogue No. 194 is now available from A. F. Bulgin and Co., Ltd., Bye-Pass Rd, Barking, Essex.

STABILISERS. — Claude Lyons Ltd., Valley Works, Ware Rd, Hoddesdon, Herts, have now circulated 3rd edition of Experimental Bulletin.

ELECTRONIC EQUIPMENT. — Sonic and ultrasonic methods for testing engineering materials with particular reference to concrete are detailed in a booklet issued by A. E. Cawkell, electronic engineer, 6-7 Victory Arcade, The Broadway, Southall, Middx.

CABLES. — G.E.C. / Pirelli General C.M.A. welding cables are detailed in a booklet issued by the General Electric Co., Ltd., Magnet Hse, Kingsway, W.C.2.

# NEWS OF THE WEEK

## Will Simple Hire Schemes Return?

### ECONOMIES IN COUNCIL HOUSE BUILDING MAY CHANGE POLICIES

SERIOUS consideration is likely to be given in the near future to the reinstitution of simple hire by some Electricity Boards. The Eastern Board have been asked by the Consultative Council to examine the practicability of reintroducing the scheme. Although simple hire arrangements still exist in that Area, they have been allowed to die out wherever possible. The electric cooker will be the main appliance involved in deliberations. Reconsideration of policy in this respect has become increasingly important in the past twelve months or so, and is not confined to this Area, because local authorities are having to make drastic cuts on expenditure in the erection of new council houses. One way in which cuts are being made is the elimination of cooking and water heating appliances and the provision of only power and/or gas points. In consequence the incoming tenant is faced with a greatly increased bill for necessary equipment.

The situation has now come to a head following the reimposition of hire purchase restrictions, small as they are. While boards offered long repayment periods (the Eastern Board allowed seven years) it was felt that new council tenants could cope. Now that the law allows only four years, it is felt that tenants finding only a socket outlet in their new kitchen will not be able to afford their cooker. Nevertheless the majority of Area Boards are against simple hire arrangements.

Other matters raised at last Friday's meeting of the Eastern Consultative Council were the possibility of a special tariff for hotels and the council's oft repeated contention that they should have a bigger say in the drawing up of the Bulk Supply Tariff. The hotels tariff has been referred to the Central Authority's Retail Tariffs Committee, and the question of bulk supply tariff shelved pending the Herbert Committee's report.

### Ministry collating News of Consultative Councils

A NEW service recently inaugurated by the Ministry of Fuel and Power will collect and disseminate items of interest to the Electricity Consultative Councils. The idea was born at a meeting of the chairmen of the Councils some time ago. It was felt that many of the activities, recommendations and decisions of one Council would be of interest and often of help to others. Consequently a Ministry official has been appointed to collect information about these bodies, edit it and pass it on.

### TRADE MISSION BACK FROM THE NILE

THE trade mission who spent nearly two months in Egypt, Sudan and Ethiopia returned to this country last week and held a Press conference on Monday. Their report on market conditions and prospects for U.K. manufacturers in those countries is to be compiled as soon as possible, but meanwhile, Mr G. C. R. Eley the leader of the party gave some general impressions. Unfortunately, Mr J. F. Perry of Metropolitan-Vickers was not present to give the electrical aspect. Mr Eley was quite definite in his opinion that there was a large potential in all three lands, especially in Egypt. They all preferred British goods. He emphasised the need for manufacturers to go out to visit the countries and study the markets anew; they had altered during the past two years since political changes had taken place.

### *PRODUCTIVITY MEETINGS IN CAMBRIDGE*

MANY industrialists in East Anglia attended two meetings to discuss productivity in Cambridge on Wednesday last week. At the first, organised by the Eastern Regional Board for Industry, it was proposed that a cash prize and trophy should be awarded annually for the best suggestion on cutting production costs. Giving details of his scheme, Mr G. Ingham mentioned four classifications: the best labour-saving idea, the best administrative efficiency idea, and the best idea for reducing costs in nationalised industries. Awards would consist of a trophy and a cheque for £5,000 provided by the Treasury. In addition, he suggested that makers of cars, TV sets, refrigerators, etc., should donate samples as prizes for the winners.

In the afternoon the Eastern Electricity Board held a meeting at which the chairman, Mr C. T. Melling emphasised the important role which electricity could play in efforts to increase productivity. He reminded his audience that automatic control of machine tools released labour for more skilled work. Mr E. A. Fowler (chief commercial officer) drew attention to the board's advisory service on industrial uses of electricity.

### *Rise for Scottish Electricians*

JOURNEYMEN electricians in the electrical contracting industry in Scotland will receive a rise of 3½d. an hour in wages with effect from 13 Mar. There are proportional increases in rates for other operatives. This settlement has been reached in the negotiations between the Electrical Contractors' Association of Scotland and the Electrical Trades Union.

### Factory and Business acquired by Electroway

IT was announced last week that the Loughborough firm of Electroway Heaters Ltd. have bought the factory of Arora Co. in Rosebery St. The agreement takes effect on 25 Mar. In the meantime the Arora Co. will continue to fulfil outstanding orders, but these will be undertaken by Electroway after that date, operating from Rosebery St.

## *B.E.A.M.A. Education Booklet goes to 2,500 Schools*

THE numerous facilities offered to young men leaving school through scholarships and grants for starting on a career in electrical engineering have been collated in a booklet published last week by B.E.A.M.A. The publication is timely, for to keep pace with the industry's continuing expansion, a steady flow of trained recruits is needed to fill the numerous responsible positions. In many cases individual companies are taking their own steps to ensure an adequate intake of students, but B.E.A.M.A. is equally aware of the importance of attracting youngsters into the industry. They have consequently prepared this booklet so that there should be a greater awareness of the training opportunities already existing in electrical engineering.

A copy of the book is being sent to over 2,500 schools and technical colleges throughout the country. It gives details of scholarships open to non-graduates, mainly those leading to a first degree in electrical engineering; post-graduate scholarships and research awards open to senior students; and scholarships and awards allowing study abroad. Incidentally, opportunities offered to women, are not forgotten.

## *New E.D.A. Conference on Rural Electrification*

STEPS to acquaint the commercial staff of the 14 Electricity Boards with the facts and intricacies of rural electrification go a stage further with the organisation of a residential conference on the subject by E.D.A. The conference is to be held at the University of Nottingham's School of Agriculture at Sutton Bonington between 28 and 30 of March. Some of the Boards have arranged courses for their own staff and one of the latest was that of the Merseyside Board in January. Over 120 representatives of the Boards in the U.K. are expected to attend. At the conference they will receive oral instruction from experts and also be afforded facilities for group discussions.

Programme for the conference includes a total of nine talks; two each morning, one in the afternoon of the first day, followed by a conducted tour of the University farm and dairy science block, and two in the afternoon of the second day. On the Monday morning Mr J. D. Irvine will open proceedings with a lecture on Farmers—Their Policy, and will be followed by Mr C. A. Cameron Brown on Farmers—Their Electricity Service. The other talk on that day will be on Load Building in Rural Areas by Mr W. J. Guscolt.

Tuesday's four lectures will be Trends in Milk Cooling Practice by Mr R. Scott, Chemicals and Steam for Sterilising by Mr P. Wakeford, Farm Electrification in Cheshire by Mr R. M. Gravett, and Mr A. W. Gray's Electricity in Commercial Horticulture. The final morning will comprise Messrs W. R. Flintoff's and R. A. Bayetto's talks on Farm Wiring Installations and Publicity Needs of Rural Electrification.

## British Pavilion at Indian Exhibition

SOME further information on the Indian Industries Fair, to be held in New Delhi between 29 Oct. and 15 Dec., were made available last week. There are to be two sections at the Fair, one of which will be for foreign exhibitors grouped in national pavilions. Countries understood to be taking part include the U.S., Russia, Czechoslovakia and Germany. There may be a small hall in the foreign section for those wishing to exhibit individually.

Organisation of the U.K. Pavilion is in the hands of Auger and Turner Group Ltd., 40 Gerrard St, London, W.1. A site of 40,000 sq ft has been booked, of which the pavilion itself will occupy 25,000 sq ft. The remainder will be for outside displays. Charge inside will be 38s. per sq ft and outside 15s. per sq ft. Enquiries for space should be sent to the organisers as soon as possible.

## Official Stands at Five Overseas Fairs

WHILST on the subject of overseas trade fairs, it will probably be of interest to U.K. exhibitors, that the Board of Trade are installing trade inquiry stands at Utrecht (22-31 Mar.), Milan (12-27 Apr.), Brussels (23 Apr.-8 May), Gothenburg (14-22 May) and Toronto (30 May-10 June). The stands will be available for discussion of problems affecting trade with the countries concerned. At the same time visitors may register their names there and business enquiries will be forwarded to them.

## FILM GIVES ELECTRICAL IDEAS FOR PRODUCTIVITY

LATEST addition to the Electrical Development Association's film library is "Planned for the Purpose," a compact illustration of the contribution that modern industrial techniques can make in the drive for increased productivity. Directed principally to managements, and to audiences who may eventually graduate to that level, the film mentions electrical methods only incidentally in its discussion of production planning: yet so essential are these methods to the modern approach that there is no lack of electrical topics in the 43 minute running time of the film.

Much of the film is devoted to an analysis of plant layout and application in modern factories in a wide range of industries, but a well presented fictional "problem" provides a connecting theme. Amongst topics introduced are plant layout, building design, the layout requirements of mass, batch and unit production, and materials handling ideas. The importance of good lighting receives attention, as do a variety of specifically electrical techniques such as high frequency heating, infra red drying and the use of electrically-powered large portable machines.

Copies of the film in 16 mm and 35 mm sizes are available free from E.D.A., 2 Savoy Hill, W.C.2.

## OFFICIAL PUBLICATIONS

WIRELESS TELEGRAPHY (Control of Interference from Electric Motors) Regulations; and WIRELESS TELEGRAPHY (Control of Interference from Refrigerators) Regulations. (See page 411) H.M.S.O. 6d. each.

BRITISH STANDARD. B.S. 807, 1955: Spot Welding Electrodes.

## LONDON AGREES TO SMOKELESS ZONE

THE City of London is to be a smokeless zone as from 2 Oct. next. The Court of Common Council last week passed a resolution to bring the provisions of the Act of Parliament secured last year into operation. Power to approve fuels, appliances, and conditions were delegated to the public health committee, and should the Act be contravened, offenders will be liable to a penalty of up to £10 and a daily fine of £5. The city has received an assurance that adequate supplies of smokeless fuel will be available.

An amendment, subsequently lost, was moved by Capt A. Instone, asking the committee to inquire into the effects of smoke from Bankside power station. Mr D. Young said there was smoke-scrubbing plant at Bankside but often it so cooled gases that they were unable to rise sufficiently. He said it would sometimes be better if the plant were not used but Board of Trade regulations had to be enforced.

## *Another Golf Date*

DATE of the S. Eastern Area Final of the E.I.B.A. National Golf Championships has been fixed. The competition will take place on 8 July at Effingham Golf Club, Dorking. Qualifying cards may be obtained from the area secretary, Mr R. E. Prickett, B.I.C.C. Ltd., 59a Middle St, Brighton.

*One of two large transformers being loaded aboard the "Portland Star" at Liverpool bound for the City of Seattle in the U.S. They were made by the English Electric Co. Ltd., and each has a capacity of 125,000 kVA 3-phase, 60 cycles, with a voltage ratio of 220/26 kV. When the order was placed it was said to be valued at about $700,000. As may be seen from our photograph the embarkation was carried out during the recent blizzard*

*A small corner of the floor on which electrical appliances are displayed in the new showrooms of A. J. Wares' Ltd. opened in Newcastle last Friday.*

## Extensive New Showrooms Opened in Newcastle

ADVOCATES of joint showrooms for both the Electricity and Gas Boards may find something akin to their idea in a new series of showrooms opened last Friday in Hood St, Newcastle. It must be quickly pointed out however that the new 11-storey building is a private venture on the part of A. J. Wares Ltd., of South Shields and has no connection with the Boards. Basic idea of the new showrooms is to house under one roof a comprehensive display of electrical appliances, gas appliances, fireplaces, bathroom and kitchen equipment, many shown under actual working conditions. They are intended for the builder, architect, local authority official and, of course, the private customer. The idea is sponsored by A. J. Wares who have specialised in the supply of household equipment of all kinds for nearly 60 years.

This company acquired the premises in Hood St, which was gutted by fire some years ago, and rebuilt it to comprise eleven Mezzanine or half-floors. We note that the electrical industry occupies a prominent position on the ground and lower ground floors. Displays in this section comprise model kitchens, sinks, electrical domestic appliances, refrigerators, clothes washing and dish washing machines, cleaners, floor polishers and many other goods. There are facilities on the first floor for film shows, and on the ninth floor for special demonstrations, to be held at regular intervals. At present in the demonstration room are installed four appliances including the Dishmaster dishwashing machine and the Bendix clothes washer. The opening ceremony on Friday was performed by Lady Isobel Barnett.

## Electricity Commissioners

SIXTH annual reunion of the former Electricity Commissioners and members of their staff was held in London last Friday. About fifty people attended, and spent an enjoyable evening recalling memories of Savoy Court days. Among those present were Lord Hurcomb, Mr C. G. Morley New, Mr R. T. G. French, Mr A. E. Marson and Mr A. N. East.

## *E.I.B.A. Jubilee Lunch*

A PARTICULAR invitation is being extended to technical and research engineers who are not markedly present at many electrical functions, to be present at the Golden Jubilee Luncheon of the E.I.B.A. on 19 Apr. Guest of the day will be Sir John Maud. It is hoped to have present a representative assembly from all sections of the many electrical industries. Applications for tickets (£1. 1s.) should be sent to the E.I.B.A. at 32 Old Burlington St, W.1.

## *A.E.I. GROUP ACQUIRE LARGE AUSTRALIAN ELECTRICAL FIRM*

IT was announced on Tuesday that Associated Electrical Industries Ltd. have acquired the whole of the undertaking of Australian General Electric Pty., Ltd., which is probably one of the largest electrical manufacturing and trading companies in Australasia. The A.G.E. have their head offices in Sydney, N.S.W., a total of five factories, and employ in these and in the sales organisation some 2,500 staff and workers. Their largest works are at Auburn, N.S.W., and Richmond, Victoria.

They manufacture a wide range of products extending from domestic electrical appliances to heavy electrical equipment. As an importer of heavy electrical plant and apparatus the Australian company has acted as agents for most of the A.E.I. Group Companies.

## Atomics in Service of Man

ISSUED for sale on Monday last was a 64 page *Daily Mail* publication "Atomics in the Service of Mankind." This contains a series of authoritative articles devoted to the peaceful uses of atomic energy by authors in the forefront of atomic energy utilisation in medicine and research, and also gives a background of the fundamentals of nuclear fission and of the availability of fissionable materials. The publication costs 2s., and is available from all newsagents.

## *All L.C.C. Schools now have Electricity*

TOMORROW, Mr I. J. Hayward, leader of the London County Council, in the presence of Mr H. J. Randall, Chairman of the London Electricity Board, Dr John Brown, the Council's Education Officer and Mr J. Rawlinson, the Council's Chief Engineer, will switch on the power to the last of the L.C.C. schools, at Peckham Park, involved in the changeover from gas to electricity.

There are about 900 county primary and secondary schools in the L.C.C. area. Conversion to electricity started before the last war but, in 1946, 300 schools remained to be converted. The post-war programme has involved the installation of 123,000 lighting points and 13,500 outlet sockets. The length of twin cable used has been about 450 miles, and the installed load about 15 MW.

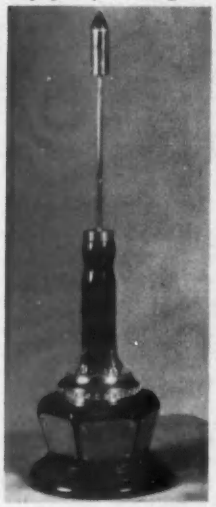
A typical school installation comprises eight or nine lighting points of 150 W in every classroom supplemented by a special chalk-board lighting fitting where considered desirable. Each classroom has in addition a general purpose mains plug point, and also a plug point for a radio loudspeaker fed from a specially designed radio receiver. Science laboratories in secondary schools are fitted with a low voltage power unit supplying terminals on the benches enabling the pupils to use a.c. or d.c. electricity at a safe voltage for experimental work. Handicraft rooms in boys' schools are wired for electric power. Similarly in girls' schools, housecraft rooms are fitted with an adequate number of plug points.

## The First Half-Century

The centre of importance in electrical supply is steadily shifting from the engineering to the commercial side of the business. In the early days the main problem was to ensure an uninterrupted supply at a steady pressure; now the chief concern is to build up a load so that big power-houses, able to supply every mortal requirement of customers, may have a chance of showing their capabilities and of earning dividends. While the power companies, on the whole, realise the immense importance of sending emissaries forth into the highways and byways, and compelling people to come on, many of the older - established electric supply undertakings, exploiting single towns under Provisional Orders, have failed to develop adequate canvassing arrangements. It is not enough today for the station engineer to rely on unpaid assistance or on desultory efforts of his own when he can spare the time: he must arrange for systematic, persistent and efficient canvassing.—*From our issue of 9 Mar., 1905.*

## *Service Competition Results announced*

RESULTS of their Service Trophy Competition were announced by E. K. Cole Ltd., last weekend. A summary of the outstanding factors leading to increased service efficiency which have been revealed in the returns for the contest are to be published later for the benefit of Ekco dealers. A silver-mounted trophy representing a soldering iron is to be given to the winning dealer in each of five television areas. Service dept. personnel will receive supplementary prizes. Winners were Stanwood Radio Ltd., Leyton, E.10; Jewkes and Co., Ltd., of Birmingham; Radio Equipment (Yorkshire) Ltd., Huddersfield; Fairbairn Ltd., Ayr; and Red Dragon Radio and TV Service, Neath.



## HARWELL CONFERENCE WILL BE OF INTERNATIONAL INTEREST

PRODUCTION and utilisation of electromagnetically enriched isotopes will be the subject of a four-day conference at the Atomic Energy Research Establishment at Harwell in September. Actual dates are 13 to 16 Sept. Several members of the team responsible for the work on stable isotopes at Oak Ridge in the U.S. will be attending. Provisional acceptances have also been received from leaders of the separator groups in France, Holland and Denmark. Much of the meeting will be occupied with problems of the electromagnetic separator itself but contributions will also be welcomed on applications of stable isotopes. Those wishing to attend are asked to write immediately to Dr M. L. Smith at Harwell. They should also indicate whether they are making a written contribution. Abstracts of papers should be submitted by 30 Apr. and completed manuscripts by 30 June. Fuller details will be sent to those making application now.

## *New Scottish Body will buy Cables*

IT has been known for some time that the E.C.A. of Scotland has been aiming at taking advantage of the new C.M.A. discount terms by bulk buying. A move in this direction is the registration in Scotland of a new contracting association, which will be known as the Scottish Electrical Contractors' Trading Association Ltd., or more familiarly as SECTA.

The E.C.A. of Scotland decided to inaugurate such a body towards the end of last year in an effort to place Scottish electrical contractors in a more competitive position. It seems doubtful, however, at this stage, whether the C.M.A. will recognise such an arrangement.

## THIRD CONFERENCE FOR SMALL MANUFACTURERS

A THIRD conference for the smaller companies is being organised by the British Institute of Management, with the help of the F.B.I. and N.U.M. It will take place at Harrogate on 29 and 30 Apr. The conference, entitled "Managing the Small Firm" has been planned with the problems of the little companies especially in mind, although no hard and fast rules of size and type of concerns have been stipulated. Subjects to be covered include finance, management, marketing, personnel and production. Conference fee is £5. 5s. and an advance programme has been published.

## Direct Shipment of Wood Poles cuts Cost

A CARGO of over 1,000 Swedish red fir poles was unloaded at Bridgwater by the 200-ton Dutch ship *Kaap St. Vincent* recently. The poles were destined for use by the S.W. Electricity Board for their rural electrification schemes in the Bristol and Taunton sub-areas. This trial cargo of treated poles from Sweden was ordered by the Board as part of their efforts to reduce the cost of rural development work by keeping down purchasing, handling and storage costs of poles. The poles will be conveyed by a special trailer equipped with winches direct from the quayside at Bridgwater to the various sites within the two sub-areas where they will be ready for erection.

## Lighting Features in Office and Factory Schemes

THERE are two lighting installations to which we draw attention this week because of notable factors contained in them. Both schemes involve large floor areas. The first is in the main office and buying department of Ferranti Ltd.'s Edinburgh works. It consisted of 36 Ediswan 5 ft open ended trough reflector fluorescent fittings and the unusual feature is the way in which the fittings have been suspended from a hung ceiling of plasterboard. Adjacent fittings have been linked by conduit and the wiring carried right through each. The installation was carried out by Ferranti's own staff.

The second concerns a furniture factory at Letchworth belonging to D. Meredew Ltd. Of special note are the detachable reflectors of the open-top type which provide through ventilation and are easily removed for cleaning. By using these reflectors much of the sawdust which would normally settle on the fittings is carried clear by convection currents. Eight lines of Atlas continuous trunking support all 112 pairs of 5 ft 80 W tubes and reflectors and contain all necessary control gear. Colour matching problems led to the choice of the white tube.

*Reflector fittings joined by conduit are a special feature of lighting in Ferranti's Edinburgh office, below, whilst in the furniture factory, right, appropriate consideration was given to the problems created by sawdust*

# NEWS IN BRIEF

General meeting of the Electrical Trades' Commercial Travellers' Association will be held at the Feathers Hotel, Westminster, tomorrow (Friday). It will be preceded by a supper at 6 p.m.

It is reported from Hungary that engineers have constructed a machine consisting basically of a high-speed electric motor fitted with a revolving device which creates air vibrations at a rate of between 20,000 and 25,000 per second.

In addition to the usual competitions, this year's Royal Show at Nottingham is to include one on electric welding.

Annual presentation of sports trophies won by members of Telcon's Social and Athletic Club, took place in the works canteen at Greenwich last week. Long service certificates were also awarded to a number of employees.

Local Press advertisements of the Eastern Electricity Board during this month is emphasising the all-electric washing day.

Classified directory of products and manufacturers in Wales and Monmouthshire, "Made in Wales," has been published by National Industrial Development Council of Wales and Mon., 17 Windsor Place, Cardiff. This is the fifth edition, which is priced at 2s. 6d.

"Payment Secured" is the title of a booklet just published, explaining the facilities offered to manufacturers by the Export Credits Guarantee Dept.

Trade exhibition of Heatovent, Reyrolle and Summit products is being organised by Sloan Electrical Co., Ltd., at the Grand Hotel, Bristol. It will be held on 21 and 22 Mar. and although primarily for those who may be unable to visit the Electrical Engineers Exhibition in London, all will be welcome.

An Electricity Board team from Pool (Cornwall) won the men's trophy in the annual first aid competition of the S.W. Branch of the British Electricity Ambulance Centre. The women's cup was won by Electricity House, Bristol. Winners will represent the S.W. Area in the national finals in London on 30 Mar.

Second annual Ladies' Night of the North East Electrical Club took place in Newcastle. Over 200 attended the dinner-dance.

An electrician's mate was awarded £1,410 damages against the S.E. Electricity Board in the Queen's Bench Division. He suffered severe burns and shock when he cut through a 6,000 V cable with a hacksaw. The Board admitted liability.

Forth Chemicals Ltd. are making good progress with the doubling of their plant capacity at Grangemouth for production of monomeric styrene. Increased demand has necessitated further expansion and the whole project should be completed early next year.

Shrewsbury centre of R.T.R.A. are to hold their annual dinner and dance on 13 Apr. at Morris's Restaurant. It is expected about 200 will attend. Tickets at 25s. from Mr J. Morris, secretary, of Smallwoods, 12 High St.

## *Shocks absorbed on Sydney Harbour Bridge*

THE Oldham (Lancs) firm of J. E. Wildbore Ltd., have received good news of a very satisfactory experiment, using their Protectafil shock absorber, carried out on Sydney harbour bridge. As is well known, this famous bridge carries a large amount of road and rail traffic and is therefore subjected to varying frequencies of vibration, to such an extent that some lamps have a life of only four to six weeks. The use of Protectafil on a lamp prolonged its life to some six months being installed in June and failing eventually on 26 Jan. The comparative lengths of life speak for themselves. Wildbore's representative in Sydney is Mr J. Hibbert of Jacoby, Mitchell and Co. Ltd.

# *QUESTIONS IN PARLIAMENT*

### P.T. Changes

AS regards the timing of announcements of alterations in purchase tax rates, Mr H. Brooke stated in a written answer that it was the Chancellor's policy to make such changes as were necessary at the best time having regard to all the circumstances.

### H.P. Restrictions . . .

ESTIMATED loss to the Exchequer following the reimposition of hire-purchase restriction was asked for by Mr C. Osborne last week, but Mr H. Brooke said several factors were involved and a calculation was impossible. Replying to another question along similar lines, Mr R. Maudling said while he believed the steps taken would tend to decrease imports and encourage exports, it was not practicable to give figures.

### . . . and Interest Rates

ASKED what rates of interest were charged per annum for hire purchase in the main trade groups, Mr H. Strauss said they varied considerably and it would be misleading to give particular rates. He also said there was no intention to control rates of interest.

### Lamps and Cables

DETAILS of steps taken by E.L.M.A. to implement the recommendations contained in the report of the Monopolies Commission, were given at some length by Mr Selwyn Lloyd last week. He said the Association had given assurances that members selling lamp components (other than patented components and ready coiled filaments) would make them available to both members and non-members without differentiation in prices in favour of the former, and that controlled companies would provide competition as suppliers of cheap lamps and would not be used as fighting companies. As regards other matters, the sales quota system had ceased; E.L.M.A. rules on type B lamps had been altered to remove quantity and quality restrictions; arrangements for exclusive dealing had ended as had payments to associations of distributors; the Association's revised rules allowed all retailers to give deferred dividends on purchases, but did not now provide for the enforcement of resale price maintenance by collective sanction of fines or stop lists.

On prices, the Commission recommended that the fixing of common manufacturers' prices could continue, provided that the exchange of technical information was extended to all makers within the common prices system, and provided also that the prices fixed were reasonable. The first condition had been met. On the second point the Commission decided that the 1950 charges were almost certainly moderate, and two subsequent increases in prices had been justified by the Association on the grounds of increased production costs.

### Illuminated Advertisements

THE Minister of Housing and Local Government said Regulations concerning illuminated signs were being reviewed to see if any changes were desirable. Mr John Hall asked if Statutory Instrument 1613, 1948, could be amended to allow all advertisements, the display of which may be undertaken without express consent under clause 12 to be illuminated. That was one point being examined.

### Duty-Free Machinery Imports

A REASON for the limit of £2,000 on the import of machinery under duty-free licences was sought by Sir W. Wakefield. He pointed out that limiting the value to that figure had ruled out many small firms, and asked if the matter could be reconsidered. Mr P. Thorneycroft said the £2,000 limit was introduced on the recommendation of the Wilson-Smith Committee, who examined the probable effect on small firms carefully. They decided it was reasonable and essential.

### National Parks

IN a written answer last week, Mr L. W. Joynson-Hicks refused to give a direction to the B.E.A. to the effect that underground cable installations in national parks and other places of beauty should not be allowed to fall entirely on local residents. This had been suggested by Mr A. Blenkinsop. He added that Electricity Boards were discussing the whole

question of electricity supplies in the parks with the National Parks Commission.

**Science Teachers**

IN a written answer last week Sir David Eccles promised to make a statement on the subject of science teachers as soon as he could. Mr Dodds had asked what steps were going to be taken following the F.B.I. committee's Jan. report on the shortage of those teachers.

**Technical Education**

TWELVE projects for additional technical education in Northumberland, Durham, and Cumberland, were under construction or had been approved to start before Mar. next year, Sir D. Eccles stated last week. Twelve more were being considered for 1956-57.

**Pensions**

ASKED again about improvements to the pension schemes existing under the Electricity and Gas Acts of 1947 and 1948, the Minister of Fuel and Power said he was carefully considering the matter and hoped to be able to make a statement very soon.

**Scottish Exhibition**

FINAL assessment of last year's Scottish Industries Exhibition was given by Mr J. Stuart on Friday. He said about 40,000 trade buyers visited it; about 90% of exhibitors considered it well worth while; two-thirds regarded it as of more value than its predecessor in 1949. Business done was estimated to have been well above the 1949 figure of £10m.

**Hearing Aids**

NUMBER of hearing aids supplied to new patients in the four years 1951-54 were 56.997, 87,925, 85,093 and 67,534, the Health Minister stated in a written answer. In addition, he said, 36,457, 66,519, 96,726 and 116,878 aids were supplied in replacement.

## *Sayings* OF THE WEEK

*"The country had a choice to make; it could have "squeeze" or "ease." "Squeeze" meant a little more hard work; "ease" meant a little more time in bed. If we had more work we could be prosperous . . ."* COL B. H. LEESON, in the discussion on the I.E.E. paper "Electrical Engineering Industry in the Post-War Economy."

*"Electricity is surely one of the best things man ever provided for woman . . ."* from "It's a Woman's World" in the *Dublin Evening Herald.*

*"I see no evidence that craftsmanship is, like the horse, out-of-date. It may be that new skills are required, but it is surely wrong to believe that the modern world can be run by a handful of Honours degree men served by a bewildered mass of unskilled labourers . . ."* SIR DAVID ECCLES, at the City and Guilds of London Institute dinner.

# *ELECTRIC SUPPLY NEWS*

**Devon**

St. Thomas Rural Council has agreed that in future it would pay the rural development charge for the supply of electricity to any of its houses in any parish. The chairman of the Housing Committee, Mr J. G. Alford, explained that it was previously recommended, regarding electricity supplies to Clyst St. Lawrence and Clyst Hydon, that where a rural development charge was paid to the South-Western Electricity Board in respect of council houses, the tenant should pay an additional rent of 2s. 4d. a week for seven years. But it seemed unjust that tenants should pay that sum more than those who already had such service. The Housing Committee's recommendation that the Council should pay, and that such payments would be a charge on the housing revenue account, was approved after some discussion.

**Eastern Board**

ESTIMATED capital expenditure on development works during the six months ending 30 Sept. next, by the Eastern Electricity Board, amounts to £4,242,985. Of that sum £1,012,734 is allocated in respect of new housing (£413,000 in the Northmet sub-area and £245,000 in the Essex sub-area). For rural development the sum of £532,656 is set aside, of which the Essex sub-area will get £123,000 the Fens sub-area £90,000, Norfolk sub-area £117,000, and Suffolk sub-area £149,532. In the reinforcement of the Board's systems the sum of £1,778,484 is allocated for the period, of which the Northmet sub-area again takes the largest share—£719,000. In addition that sub-area will spend £140,000 on the provision of new or reinforcement of existing points of bulk supply out of a total of £305.251 set aside for that purpose for all sub-areas.

The Board work progress sheet shows that 6,590 new consumers were connected during the month of November, 1,903 of those being in the Essex sub-area.

**Glamorgan**

While welcoming in principle the plan of the B.E.A. to erect a new generating station at The Leys, Glamorgan Planning Committee decided last Friday to express a formal objection to the scheme so as to take part in discussions with a view to safeguarding interests concerned with The Leys site. At the meeting it was stated that under the proposals, nearly 400 acres would be acquired, of which 130 acres are at present used by Barry Golf Club. The main power station building would be 530 ft long and 350 ft wide, with twin chimneys 425 ft high. The station would be coal-fired, and use 22 million gallons of water from Bristol Channel for cooling purposes. Mr E. J. Powell, county planning officer, reported that of twenty bodies consulted concerning the scheme, objections had been expressed by Cardiff Rural Council (regarding siting of transmission lines), the Council for the Preservation of Rural Wales, National Parks Commission and the Nature Conservancy.

**North of Scotland**

Alterations to the Glen Lochay section of the Breadalbane hydro-electric scheme, to improve water storage arrangements, are to be made by the North of Scotland Hydro-Electric Board.

**Northern Ireland**

ONE of the twelve nuclear power stations to be built in the United Kingdom would be in Ulster, Lord Glentoran, Northern Ireland Minister of Commerce stated last week end. He could not say, however, when the station would be built or where it would be sited. The Minister was elaborating his earlier pronouncement that it was the Government's intention and expectations that Northern Ireland would have a nuclear power station within ten years. Kennedy and Donkin, the consulting engineers, have begun investigations into technical aspects of Ulster's power station programme. A decision as to whether the new power station, planned for 1961-62, would be oil or coal fired, or use nuclear energy, would probably be reached within the next few months.

**Scotland**

Reporting on progress made in the Southern sub-area of the South-East Scotland Electricity Board, Mr G. H. Sankey, the sub-area manager, has stated that since 1 Apr., 1954, 102 farms had been provided with an electric supply, bringing the total connected to 36%—in 1948 only 10·9% of the farms were connected. The capital budget for 1955-56 was based on an expenditure on rural development of £200,000. If this rate remained constant until 31 Mar., 1959, it would meet all outstanding rural development schemes and leave a margin of £170,000 for individual farms. This would provide for 170 farms in addition to the 500 farms included in the schemes still to be undertaken. The percentage of farms connected by 31 Mar., 1959, would be 71·5%. Mr Sankey also stated that preparations for supplying Holy Island, off the Northumberland coast, would begin when a suitable submarine cable could be obtained.

**LIGHTING SCHEMES**

**Bushey (Herts).** The surveyor has been asked to submit a comprehensive report on the conversion of gas lighting.

**Dudley.** The council is recommended to convert all street lighting to electricity.

**Horsforth.** Approximately £15,000 is to be spent by the council on improving street lighting.

# COMPANY ACTIVITIES

FROM £332,000 last time, group profits of the Bakelite group have rebounded to £649,000 for 1954. The set-back in 1953 was caused by over-production in the industry. Some of the weak production has been weeded out and demand has risen substantially. Bakelite has been able to make full use of the recovery and it has enjoyed for the first full year, the benefit of its new Aycliffe factory. Despite the cautionary note with the interim dividend of 5% last October, the full year's dividend is brought up to 16% against 12½%. The 10s. shares at 30s. 6d. yield about 5¼%. Earnings yield is only 12·4%. Neither of these is very impressive, apart from the fact that the demand for plastics is still rising, especially for thermo-plastics. Bakelite is one of the main producers of polyvinyl chloride, probably the most successful thermo-plastic.

Our heavy industry is going to be busy, very busy, for many years ahead. In recent weeks we have discussed the prospects of increased activity due to the railways 15-year modernisation plan. Then followed plans for the atomic age. And now we have the B.E.A. with its £60 millions new power station on the Trent which will probably be the largest in Europe. Already English Electric and International Combustion have received orders for part of the work, running into many millions, and I expect other orders to follow shortly. In the meantime Associated Electrical Industries report profits at a record £11,736,000 and a dividend payment worth £1,366,000 for shareholders, as compared with £1,097,000 for the previous year. Even after heavy charges for replacing fixed assets the A.E.I. earnings were over 48% and the 14% dividend was covered nearly 3½ times. With Siemens Bros. now completely acquired, A.E.I. should be in a position to tackle anything that comes its way.

There is a lot of money too in condensers and instruments for submarine telegraphy, according to the latest results of Telegraph Condenser Co., shareholders of which are getting 25% for the year on a bonus-doubled capital, as against 30% paid on the lower capital last time. Up to last April the company was doing an enormous business. Both its factories were working to capacity due to renewed demands for the enormous range of fixed electrical capacitators, in which the company specialises.—*From our City Correspondent.*

### Associated Electrical Industries

During 1954 the factories of the group attained a level of production exceeding in both value and volume all previous years, despite increased foreign competition, it is stated in the full report and accounts. Stocks and materials on hand, work and contracts in progress are valued at £38,867,454—over £2 millions more than a year ago.

### Bakelite Ltd.

There is a substantial increase in profit for the year ended 31 Dec. last. After charging nil (*£87,986*) for special expenditure incurred in respect of a new factory and after crediting £17,384 (*£124,139*) specially provided in previous years, the group profit is £648,829, compared with £332,367 a year ago. With a final dividend of 11%, the total distribution for the year is raised to 16%—3½% more than for the previous twelve months.

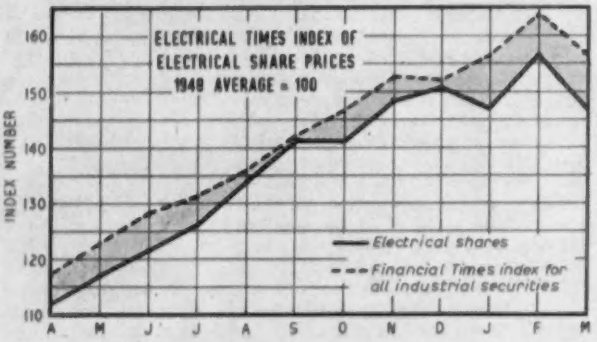
### Bruce Peebles and Co. Ltd.

With expanding manufacturing capacity, and the value of orders on the books exceeding £4 millions, Sir William Darling, chairman, is very confident as to the future for this company. Its financial position has also been improved by an increase of over £228,000 to £428,365. in cash in bank and on hand. These cash resources may be fully utilised in the near future—further extensions to the East Pilton works are under consideration, he reports.

| Year to 31 Dec. | £ Trading Profit | £ Net Profit | % on Ord. Earned | % on Ord. Paid | Ord. Price High | Ord. Price Low |
|---|---|---|---|---|---|---|
| 1950 | 223,200 | 99,602 | 99 | 12½ | 44/4½ | 35/– |
| 1951 | 293,081 | 108,325 | 113 | 15 | 55/3 | 45/– |
| 1952 | 263,185 | 85,167 | 88 | 15 | 56/3¾ | 48/– |
| 1953 | 423,726 | 136,256 | 136 | 15* | 62/9 | 54/9 |
| 1954 | 448,516 | 203,700† | 103 | 15† | 6½ | 61/– |

*Plus 10% special bonus.
†Plus 100% capital bonus.

*Last month's fluctuations on the Stock Exchange are reflected in our graph. The "Financial Times" index for all industrial share prices fell to its end-of-1954 level of 156·7 a decline of 7·5. There was only 0·1 difference between the "Electrical Times" index at the end of December and February. Latest figure is 147·5 a fall of 9·2*




### Brown Brothers

After charging taxation of £412,269 (*£263,055*), the group net profit for 1954 is £309,103, compared with £230,000 a year ago. The final dividend is raised by 1% to 12½% making a total of 15% (*14%*).

### Clarke, Chapman and Co. Ltd.

The past year has shown a big leap forward in profits compared with the steady increase over the previous four years, it will be seen from our accompanying table. Further expansion is reflected in the value of work in progress, stock of goods, stores and materials, which amounted to £2,387,151 at the end of 1954, compared with £2,128,482 a year earlier. Estimated commitments for capital expenditure not provided for in the past year's accounts amount to £200,000.

| Year to 31 Dec. | £ Trading Profit | £ Net Profit | % on Ord. Earned | % on Ord. Paid | Ord. Price High | Ord. Price Low |
|---|---|---|---|---|---|---|
| 1950 | 462,630 | 217,687 | 68 | 15 | 58/9 | 43/9 |
| 1951 | 513,872 | 233,821 | 77 | 15 | 70/4 | 53/9 |
| 1952 | 551,793 | 273,642 | 91 | 17½ | 58/1 | 49/3 |
| 1953 | 587,795 | 272,999 | 85 | 20* | 71/– | 57/6 |
| 1954 | 784,251 | 393,791 | 82 | 20 | 73/6 | 47/6 |

*Plus 50% capital bonus.

### General Electric Co. Ltd.

The offer of 1,959,240 Ordinary £1 shares of 48s. each resulted in acceptances as "rights" totalling 1,813,000—92·5%. There were 8,054 excess applications totalling 1,663,000 shares which are to receive various allotments.

### S. Guiterman and Co. Ltd.

Although a dividend of 7½% is again recommended, operations in the year ended 31 Dec. last resulted in a consolidated net loss of £3,762, as against a profit of £3,967 after £5,000 taxation in the previous year.

### Mather and Platt Ltd.

Business prospects for the current year are good and granted no unforeseen difficulties arise and a greater stability in world affairs, there is no reason why 1955 should not be a satisfactory year, Mr L. E. Mather, the chairman reports. The improved results in 1954 reflect great credit on the managers and all the employees.

### Max Stone Ltd.

For the year ended 30 June last, the group profit is £156,716, as against £116,184 for the previous period, after charging taxation of £237,391 (*£215,895*). There is no final dividend—an interim of 20% was paid, and an interim of 30% has already been declared in respect of the year ending 30 June, 1955.

### Telegraph Condenser Co. Ltd.

The trading profit for 1954 amounts to £473,682 (*£460,897*), and the final dividend of 20% makes a total of 25% for the year on capital increase last May by a bonus issue.

# COMMERCIAL INFORMATION

## Contracts Open at Home . . .

*Dates given are the final for receipt of tenders unless otherwise stated.*

**11 Mar.—Belfast T.C.** 14 in. bore parallel slide valve for steam plant and bomb calorimeter.—Advertised in 17 Feb. issue.

**11 Mar.—Dublin T.C.** Supply of 10,000 yd P.B.J. cable.—See 24 Feb. issue.

**11 Mar.—Southport T.C.** Installation at the Lido, Promenade, Ainsdale.—See 17 Feb. issue.

**12 Mar.—Airdrie T.C.** Lamps in year from 16 May.—See 3 Feb. issue.

**12 Mar.—Barrow.** Lamps and maintenance of refrigerators.—See 24 Feb. issue.

**12 Mar.—Beccles T.C.** Lamps and electrical materials and services in year from 1 Apr.—See 24 Feb. issue.

**12 Mar.—Ennerdale (Cumb.) R.D.C.** Wiring of 22 houses at Cleator Moor. Surveyor, Council Offices, Cleator.

**12 Mar.—Peterborough T.C.** Steel columns with electrical equipment and lanterns.—See 3 Mar. issue.

**12 Mar.—Walsall T.C.** Rewiring Bloxwith Baths.—See 3 Mar. issue.

**14 Mar.—Cardiff T.C.** Installation in Llanrumney school for girls.—See 17 Feb. issue.

**14 Mar.—Cheltenham T.C.** Concrete columns, sodium discharge lamps lanterns, etc., for London-Fishguard Rd.—Advertised in 17 Feb. issue.

**14 Mar.—Grimsby.** Installation in old people's home in Littlecoats Rd.—See 17 Feb. issue.

**14 Mar.—Lancashire.** Electrical installation in Audenshaw Poplar St secondary modern school. Apply by above date to County Architect, P.O. Box 26, Preston.

**15 Mar.—N. Ireland.** Installation at Kesh county school.—See 3 Mar. issue.

**15 Mar.—Lancashire.** Electrical installation in Middleton school clinic and child welfare centre. Apply by above date to County Architect, P.O. Box 26, County Hall, Preston. Deposit £2.

**15 Mar.—Romford T.C.** Electrical installation in 144 flats in Rush Green Gdns, and 54 flats at White Hart Lane. Borough Engineer and Surveyor, Town Hall. Deposit £2 2s.

**16 Mar.—Dublin T.C.** Supply of fluorescent lamps in year from 1 Apr. for public lighting dept. Finance Dept., City Hall.

**16 Mar.—Reading T.C.** Wiring of 96 houses on Shinfield estate and 450 houses on Oxford Rd estate. Borough Architect, Town Hall.

**16 Mar.—Scunthorpe T.C.** Steel columns, fluorescent lanterns, etc.—Advertised in 24 Feb. issue.

**16 Mar.—Scunthorpe T.C.** Concrete columns, mercury discharge lanterns for Manor Farm estate.—Advertised in 24 Feb. issue.

**16 Mar.—Stoke-on-Trent T.C.** Concrete columns with lanterns and accessories for mercury discharge lighting along main roads.—See 24 Feb. issue.

**16 Mar.—Sunderland T.C.** Installation at Villette Rd school clinic.—See 3 Mar. issue.

**18 Mar.—Durham.** Electrical installation in police H.Q. at Whickham. G. R. Clayton, Architect to Police Authority, Court Lane.

**18 Mar.—Midlothian.** Supply and erection of 34 140 W sodium lamps on 25 ft concrete columns along Gorebridge Rd. Also supply and erection of 67 80 W mercury fluorescent lamps on 15 ft steel columns in Gorebridge. Separate contracts. County Surveyor, 32 Palmerston Place, Edinburgh.

**19 Mar.—Worsley U.D.C.** Class A concrete columns, lamps and lanterns for 140 W sodium lighting. — See 3 Mar. issue.

**21 Mar.—Manchester T.C.** Installation in old people's dwellings at Middleton.—Advertised in 3 Mar. issue.

**21 Mar.—Wigan T.C.** Street lighting equipment for various schemes.—See 3 Mar. issue.

**22 Mar.—Belfast.** Installation of electric goods lift at Min. of Commerce Forensic and Industrial Science Laboratory, Vener St. Documents from Ministry at Law Courts Bldg (Room 103), May St.

**22 Mar.—Shrewsbury T.C.** Supply of two electrically-operated sewage pumps or compressed air ejectors. Borough Surveyor, Guildhall.

**23 Mar.—Co. Antrim.** Electrical installation in Finaghy primary school extension. J. McCandless, consulting engineer, 6 Murray St, Belfast. Deposit £3. 3s.

**23 Mar.—Clutton (Bristol) R.D.C.** Installation in 50 houses at Timsbury.—See 3 Mar. issue.

**25 Mar.—Manchester T.C.** Various types of service cables and telephone cable at Haweswater Works, Westmorland.—Advertised in 24 Feb. issue.

**25 Mar.—Roxburghshire.** Electrical work in eight houses at Denholm. County Architect, County Offices, Newtown St, Boswells.

**26 Mar.—Stockport T.C.** Electrical installation in total of 229 dwellings on Brimmington estate. Apply by 12 Mar. to Borough Surveyor, Town Hall. Deposit £3. 3s.

**30 Mar.—Warrington T.C.** Rewiring at Central Police Station in Arpley St. Borough Surveyor, Town Hall.

**30 Mar.—Yeovil T.C.** Supply and erection of 15 A steel columns with lanterns, lamps, etc., for 37 80 W mercury vapour lamps and 37 100 W tungsten lamps, for street lighting scheme 1955-56. A. Heal, Borough Surveyor, Municipal Offices, King George St.—Advertised in this issue.

**31 Mar.—Belfast T.C.** Central evaporating plant.—Advertised in 27 Jan. issue.

**31 Mar.—Carlisle T.C.** Electrical installation in crematorium. City Surveyor, 18 Fisher St.

**31 Mar.—Inverness.** Electrical work in erection of primary school at Hilton. —See 3 Mar. issue.

**2 Apr.—Cheadle and Gatley U.D.C.** Group A concrete columns with sodium lamps and lanterns in Wilmslow Rd.—See 3 Mar. issue.

**6 Apr.—Wandsworth B.C.** Concrete columns and ancillary gear for groups A and B street lighting.—Advertised in 10 Feb. issue.

**6 Apr.—Wandsworth B.C.** Sodium discharge lamps and jackets for route J.—Advertised in 24 Feb. issue.

**7 Apr.—Belfast T.C.** 3,300 V and 400 V switchgear and accessories. Also (closing date 24 Mar.) extensions of coal handling plant.—Advertised in 10 Feb. issue.

**14 Apr.—Plymouth T.C.** Supply and installation of six electrically-driven pumps with deliveries of from 2,500 to 500 g.p.m. for Water Dept. N. G. Elliot, City Water Engineer, 22 Portland Sq. Deposit £2. 2s.

**18 May—Dublin T.C.** Electrically-driven sewage pumps for Clontarf station.—See 24 Feb. issue.

**No date stated—Garforth U.D.C.** Electrical work and supply of lamps in year from 1 Apr.—See 3 Mar. issue.

**No date stated—Wednesbury T.C.** Installation in 40 bungalows on Millfields estate.—See 3 Mar. issue.

**No date stated—West Fife.** Electrical work in boilerhouse and X-ray dept. of Northern Hospital, Dunfermline. Ian Hunter and Partners, 46 Palmerston Place, Edinburgh.

## Your Queries Answered

*Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries*

***A Selection from the 116 queries answered this week***

**Lighting system using plastic sheeting as a diffusing medium,** makers of? L.E.C.—Lumenated Ceilings Ltd., 4 Lloyds Ave, E.C.3.

**"Polimop" polisher,** suppliers of? W.J.C. —Aarden Lewis Ltd., 52 Valley Rd, S.W.16.

**Roasting ovens with spits,** suppliers of? S.E.—A. E. Warner (London) Ltd., 56 Brewer St, W.1; "V" (Development and Trading) Ltd., 22 Clifton Rd, W.9.

**"Bungalow" fires,** makers of? J.C.—Belling and Co., Ltd., Bridge Works, Enfield, Middlesex.

**"Keith" toaster,** address for? L.E.—This toaster was taken over from Keith Electrical Industries Ltd by Roevac Metal Pressings Ltd., this concern, however, went out of business in 1952.

**"Moffat" cookers,** address for spares? E.S.—For the British made (white enamel) cooker, Duckworths, 788 Whalley Rd, Blackburn; and the Canadian made (cream enamel) by Moffats (Overseas) Ltd., 1 Newman St, W.1.

**Piano heaters,** makers of? T.E.—Warmglow Co., Ltd., Progress Rd, Leigh-on-Sea, Essex; B. Whittaker, 253 Bury New Rd, Heywood, Lancs.

# . . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

**24 Mar.—S. Africa.** Supply, erection, or extension, etc., of two 6,600 V switchboards for O.F.S. Goldfields Water Supply. Union Tender and Supplies Board, 291 Bosman St, P.O. Box 371, Pretoria. B.o.T. (Ref.: E.S.B. 3904/55).*

**28 Mar.—Brazil.** Comissao Estadual de Energia Electrica invite tenders for supply of 2,600 three-phase electric meters. Commission is at Edeficio Novo da Prefeitura, 11 andar, Porto Alegre, Rio Grande do Sul. B.o.T. (Ref.: ESB 4346/55).*

**30 Mar.—New Zealand.** Supply of 3,415 capacitors and 1,370 clamps of various types for Stores Division of Post and Telegraph Dept., Windsor Building, Willis St, Wellington. Tender No. P. and T. 157/238. B.o.T. (Ref.: ESB 3421/55).*

**30 Mar.—South Africa.** Tenders (C.8908) invited for supply of various electrical catering equipment by Stores Dept. of S. African Railways at Johannesburg. B.o.T. (Ref.: ESB 4240/55).*

**31 Mar.—Australia.** Hydro-Electric Commission of Tasmania, Box No. 631, B, G.P.O., Hobart, invite tenders (Specification No. C.E.489) for supply of electrically driven pumping plant for Tarraleah power development .No. 2 Canal. Documents available from Agent General for Tasmania, 457 Strand, London, W.C.2.

**31 Mar.—India.** Supply of 200 AH battery blank, generating sets, battery charging panels, d.c. distribution boards, auxiliary power transformers, dry type unit auxiliary transformers with associated 11 kV and 3·3 kV switch gear, l.t. a.c. switchboard and auxiliary supply control panel, for Maithon hydro-electric power station. Tender No. Ed.780-1. Damodar Valley Corpn., Anderson Hse, Alipore, Calcutta. B.o.T. (Ref.: ESB 3995/55).*

**1 Apr.—U.S.A.** Tenders (CIVENG-45-108-55-42) invited by Seattle District Corps of Engrs. for supply of three 1,033,000 kVA transformers. B.o.T. (Ref.: ESB 3798/55).*

**5 Apr.—S. Rhodesia.** Annual supply of switchgear, fuse gear and ancillary gear, including oil circuit-breakers, transformers, multicore cables, busbars, etc., for City of Salisbury. Contract No. S.61/55. Bids to Town Clerk, P.O. Box 990, Salisbury. B.o.T. (Ref.: ESB 4572/55).*

**11 Apr.—Iraq.** Supply, erection of two transformers, each 1,000 kVA, to Ramadi Electricity and Water Board. Tender No. 93. Directorate General of Municipalities, Baghdad. B.o.T. (Ref.: ESB 4426/55).*

**12 Apr.—Iraq.** Directorate General of Municipalities, Baghdad, require three diesel electric generating sets, 50 kW, a.c., 230/400 V, 3-phase, 50 cycles, to be operated in Town of Hit. Tender No. 94. B.o.T. (Ref.: ESB 4427/55).*

**15 Apr.—Philippines.** National Power Corporation, Manila, require two hydraulic turbines, two governors, and two inlet valves, and/or two generators, a power transformer, complete switchgear for Agusan River Hydro-Electric project. B.o.T. (Ref.: ESB 3461/55).*

**20 Apr.—S. Rhodesia.** Supply, etc., of 3-phase oil-immersed air natural cooled. outdoor-type 11,000/400 V Delta/Star transformers with oil and accessories. Contract E.183/1955. City of Bulawayo's Electricity Dept. B.o.T. (Ref.: ESB 4321/55).*

**4 May.—Australia.** Supply of one internal combustion engine driven generating plant for Blackhall Shire Council. Continuous rated output of about 150 kW, alternatively 190 kW, with engine operating as gas engine. Specification No. 489. State Electricity Commission of Queensland, Scottish Union Hse, Eagle St, Brisbane. B.o.T. (Ref.: ESB 3627/55).*

# PRICES of cable metals and other materials

***Figures quoted are the official prices ruling on Tuesday, 8 March***

| | £ per ton | Weekly change £ | Price last year £ |
|---|---|---|---|
| COPPER, standard class A (settlement) | 344 | +1½ | 236 |
| „ (3 months) | 328½ | −3½ | 226 |
| LEAD, refined pig, min. 99·97% purity (cash) | 103 | −½ | 86½ |
| „ (3 months) | 102 | −½ | 85½ |
| TIN, refined, min. 99·75% purity (settlement) | 707 | −6 | 710 |
| „ (3 months) | 710 | −7½ | 682½ |
| ALUMINIUM, ingots 99·99·5% | 163 | — | 156 |
| ZINC, virgin, min. 98% purity (cash) | 87½ | +¼ | 73¾ |
| „ (3 months) | 86¾ | +¼ | 72½ |
| RUBBER No. 1, RSS. spot (per lb.) | 25⅝d. | −1⅛d. | 16¼d. |
| „ c.i.f. basis, ports. May (per lb.) | 24¼d. | −1⅛d. | 16 7/16d. |
| ARMOURING : | | | |
| Galv. Steel Wire (0·104 in.) | 52½ | — | 52 |
| Mild Steel Tape (0·014 in.) | 41¼ | — | 40 |

# TRADE MARKS

*This information is extracted from the Official Journal by permission of the Controller.*

**Viceroy.** 734,484. Class 9. Vacuum cleaners. Neptric Ltd., 73/79 Hurst St, Birmingham 5.

**Atomcom.** 734,837. Class 9. Intercom. apparatus. Neltic Ltd., Neltic Hse, Charteris Rd, N.4.

**Plesseynato.** 736,380. Class 9. Electrical apparatus, etc. Plessey Co., Ltd., 56 Vicarage Lane, Ilford, Essex.

**Prestwarm.** 733,544. Class 11. Electrical space-heating appliances. R. H. Everest, Prestige House, Imperial Drive, Harrow.

**Pixie.** 737,642. Class 7. Washing machines. British Vacuum Cleaner and Eng. Co., Ltd., Goblin Works, Ermyn Way, Leatherhead, Surrey.

**Permatip.** 737,639. Class 9. Soldering irons. Light Soldering Developments Ltd., 30/32 Devonshire Rd, S.E.23.

**Atomette.** 735,106. Class 11. Lighting installations and appliances. Courtney Pope (Electrical) Ltd., Amhurst Park Works, Seven Sisters Rd, N.15.

**Temsul.** 737,940. Class 17. Insulating materials, etc. Watliff Co., Ltd., Lombard Rd, S.W.19.

**Novatone.** B.736,646. Class 9. Electromedical acoustic apparatus, etc. Geo. Taylor, 55 West Cromwell Rd, S.W.5.

**Scotram.** 734,529. Class II. Lighting installations and fittings. R. S. Guthrie (Scotland) Ltd., 9a West Maitland St, Edinburgh 12.

**Parnall.** 730,260. Class 7. Wringing and washing machines. 730,261. Class 11. Cookers. Parnall (Yate) Ltd., 255 Nth Circular Rd, N.W.10.

**Columbus.** 734,694. Class 7. Scrubbing, floor waxing, polishing and squeegee machines, etc. 736,695. Class 9. Vacuum cleaners, dust extractors and carpet sweeping machines, etc. Rollnick and Gordon Ltd., Capitol Works, Empire Way, Wembley. Middx.

# Contracts Placed

**B.E.A.** Supply of following: Two 60,000 kW turbo-generators at Belvedere, English Electric Co., Ltd.; high pressure pipework and valves at Littlebrook C, C. A. Parsons and Co., Ltd.; one 60,000 kW turbo-generator at Marchwood, English Electric Co., Ltd.; one 60,000 kW turbo-generator at Portishead B, Metropolitan-Vickers Electrical Co., Ltd., and high pressure pipework and valves at same, Stewarts and Lloyds, Ltd.; 11 kV and lower voltage cables and accessories at Tilbury, Malcolm and Allan (London), Ltd.; 3·3 kV auxiliary switchgear at Willington A, English Electric Co., Ltd.; four 550,000 lb/hr boilers at Ince, International Combustion, Ltd.; one 60,000 kW turbo-generator at Elland, Metropolitan-Vickers Electrical Co., Ltd.; 415 V auxiliary switchgear at Ferrybridge B, Brookhirst Switchgear, Ltd.; high and low pressure pipework at Chadderton, Stewarts and Lloyds Ltd.; two 15 MVA 66/11 kV transformers at N. Hammersmith substation, Ferranti, Ltd.; two 75 MVA 132/66 kV main transformers and one auxiliary transformer at Herrington Burn substation, Ferranti, Ltd.; and standardised system of general indication and telephone equipment in Manchester area, Automatic Telephone and Electric Co., Ltd.

**Edmonton (Middx.) T.C.** Improved street lighting in Bounces Rd, Eastern Electricity Board, £1,227.

**Middlesbrough T.C.** Installation in old people's hotel at Thorntree, Horne and Co., Ltd., £2,589.

# TRADE NOTES

**Change of Address.** The Domestic Appliance and Television Division Service Department of the English Electric Co., Ltd., has been transferred to Dunnings Bridge Rd, Netherton, Liverpool 10. Telephone Liverpool Aintree 5201.

**Ceylon Import Duty.** The Ceylon Government has announced a 10% reduction in import duty on industrial refrigerators to bring the tariff down to GATT agreement level. The preferential duty is now 22½% ad valorem and the general duty 27½% ad valorem. The duty on domestic refrigerators is unchanged at 35% and 40% ad valorem respectively. It has also been announced that machinery—so far unspecified—imported for essential industrial development would carry a preferential import duty rate of 2½% ad valorem and a general rate of 12½% ad valorem.

# BUSINESS PROSPECTS

## Home

**Ayr.** Dean of Guild Court has approved erection of R.C. primary school at Dalmilling Drive. Estimated cost, £62,000.

**Bletchley.** Factory No. 6 to be built on industrial estate. Engineer and Surveyor, Council Offices.

**Bolsover (Derby) U.D.C.** Castle estate to be completed by erection of 102 houses.

**Borehamwood (Herts).** Sketch plans approved for erection of £47,754 infant's school in Hillside Ave.

**Brandon U.D.C.** Loan sanction for £154,490 received for 114 houses at Brandon colliery.

**Brighton T.C.** Erection of factory on Hollingbury industrial estate. D. J. Howe, 26-30, King's Rd.

**Buxton.** Plans approved for erection of clothing factory and shops for H. Beenstock (Spear) Ltd., 68 Cannon St, Manchester, in Queens Rd.

**Cardiff T.C.** Construction of 34 houses in Penrhos Cresc., Rumney. City Surveyor, City Hall. And **R.D.C.** Erection of 36 flats on Station Rd site, Rhoose, S. P. Youldon, Engineer, Surveyor and Architect to Council, 20 Park Place.

**Croydon.** Douglas Holt (1919) Ltd., 5 Eagle St, W.C.1, to build factory in Vulcan Way. Architects are Barnard and Smith, 50 Knightsbridge Court, S.W.1, and cost will be about £150,000.

**Cumberland.** C. B. Pearson and Son, Dalton Sq, Lancaster, has been appointed architect for new hospital to be built at Hensingham, near Whitehaven. Cost estimated at £1,250,000.

**Dagenham T.C.** Construction of 38 houses and 42 flats, and 66 houses and 8 flats, on Marks Gate estate. Borough Engineer and Surveyor, Civic Centre.

**Dublin.** Erection of proposed new secondary school at Walkinstown for Irish Christian Brothers. Leonard and Williams, quantity surveyors, 32 Nassau St, Dublin.

**Durham.** Scheme being considered for rewiring Shire Hall at cost of £6,000.

**East Suffolk.** Estimate of costs of secondary modern schools included in 1955-56 programme submitted for Ministry approval are £96,140 at Saxmundham, same at Halesworth, and £88,220 at East Bergholt.

**Eccles (Lancs).** It is proposed to build 146 houses on part 2 of Brookhouse estate.

**Enfield U.D.C.** Construction of 4 shops with maisonnettes and block of 12 flats in High St, Ponders End. Engineer and Surveyor, F. Lee, 7 Little Park Gardens.

**Eston U.D.C.** Erection of 34 houses on Crossbeck estate, N. C. Harrison, Engineer and Surveyor, Normanby Rd, South Bank, Middlesbrough.

**Glasgow.** Architects for premises to be built by H. J. Heinz and Co., Ltd., are J. D. Mathews and Partners, 3 Ebury St, S.W.1.

**Harrogate.** Four-storey office building in Raglan St, proposed by Lime-Sand Mortar Ltd., Barclays Bank Chambers, Knaresborough.

**Holland.** County Council propose secondary modern schools at Kirton (£17,000), at Holbeach (£152,542), and at Long Sutton (£187,000), primary school at Wyberton (£35,696), and conversion of Gosberton Hse into special school, costing £42,795.

**Haltwhistle.** W. Stockdale of 73 Howard St, North Shields, is architect for proposed Masonic Hall in Park Rd.

**N. Ireland.** Large factory proposed by Gallaher Ltd., tobacco manufacturers, and site in Ballymena has been surveyed.

**Jarrow-on-Tyne T.C.** Scheme prepared for redevelopment of Queens Rd area. Provision made for 391 buildings.

**London.** Block of offices to be built in New Bridge St for David Cope Ltd. Shingler and Risdon, 47 Bedford Row. W.C.1, are architects.

**Middlesbrough T.C.** Permission sought to carry out additions to College of Art at cost of over £42,000.

**Newbury (Berks).** Plans submitted by H. and G. Howarth for erection of garage and petrol filling station in London Rd.

**Oldham T.C.** Erection of 55 houses and 28 flats on Holts estate. Cameron and Middleton, chartered quantity surveyors, 21 Queen St.

**Prescot U.D.C.** Erection of 50 houses on St. James estate. Engineer and Surveyor, Council Offices.

**Rushden U.D.C.** Erection of 56 houses in Allen and Blinco Rds. Engineer and Surveyor, Council Buildings.

**Shardlow (Derby) R.D.C.** It is proposed to erect 50 houses at Borrowash, 30 at Spondon and 20 at Sandiacre.

**Southport.** Plans prepared for High School for girls at Hillside. Estimated cost, £170,000.

**South Shields.** Third instalment of Technical and Marine College to be carried out in 1956-57. Architects are Meade-Taylor and Wilson, 17 Sheffield Terr, Camden Hill, London, W.8. Work to start in June on new bus station.

**Sunderland T.C.** Loan sanction received for £464,172 for erection of 356 houses on Farringdon estate, and for £359,549 for 87 houses at Southwick and 182 houses on Grindon Nookside estate.

**Swinton and Pendlebury T.C.** Erection of 13 shops with maisonnettes. Borough Engineer and Surveyor, Town Hall, Swinton.

**Ulverston (Lancs).** Sketch plans approved for six shops with living accommodation on Croftlands Park estate.

**Upton-on-Severn (Worc) R.D.C.** Tenders to be invited soon for modernisation of pre-war houses.

**Wakefield.** Plans submitted by F. Blackhouse for utilisation of land in Caldervale Rd for factory.

**Worthing T.C.** Approval granted to school building programme which includes new mixed secondary in Terringes Ave, estimated to cost £204,000.

**York T.C.** Application for sanction to borrow £104,155 for extension to Nunthorpe grammar school.

## Overseas

**Saudi Arabia.** Quotations from U.K. firms for fluorescent lighting equipment sought by Ahmed and Eisa Al Jalahima, Al Khober.

Suleiman Ghonaim and Abdullah Balkail, Dammam, would like to receive quotations from U.K. manufacturers of domestic electrical goods.

**Thailand.** It is reported that there is an urgent need for commercial catalogues. U.K. firms should keep their agents well supplied with the latest literature, and send them to various Government trade departments.

# Gazette Announcements

### COMPANIES ACTS

**Repetition Engineering Service Ltd.** Last day for receiving proofs in respect of intended dividends is 16 Mar. Liquidator is J. M. Clarke, senior official receiver and liquidator, Inveresk Hse, Strand, London, W.C.2.

**Ensure Battery Co., Ltd.** Meeting of creditors will take place at offices of Charlesworth, Wood and Brown, Bank Buildings, Skipton, Yorkshire, at 3 p.m. on 23 Mar.

**Edolite Lamps Ltd.** First and final dividends of 7½d. in £. payable on 12 Mar. at office of A. T. Eaves, 47 Mosley St, Manchester.

**Thames Technical Co., Ltd.** Meetings of creditors and contributories will take place on 15 Mar. at Inveresk Hse, Strand, London, W.C.2, at 2.45 p.m. and 3.15 p.m. resp.

**Trevor Johnstone Co., Ltd.** Resolution for winding-up passed at meeting on 24 Feb. At subsequent meeting of creditors Mr D. A. Jacobs, F.C.A., of 18 Bentinck St, W.1, was appointed liquidator. Creditors should send particulars to him by 18 Apr.

**Refrigeration Wholesale Supplies Ltd.** Resolution for voluntary winding-up passed at meeting on 1 Mar. B. Phillips, F.S.A.A., 76 New Cavendish St, W.1, was appointed liquidator and creditors should send particulars to him by 5 Apr.

### BANKRUPTCY ACTS

*Receiving Order*

**Kingston-on-Thames.** Charles J. Callander, electrical dealer of 60 Beverley Way, West Wimbledon. Date of receiving order, 23 Feb.

*Public Examination*

**Shrewsbury.** Herbert J. Gornall, electrical engineer trading at 12 Fish St, Shrewsbury. Public examination will be at Shire Hall, Shrewsbury, on 21 Mar. at 2.15 p.m.

*Dividends*

**Liverpool.** William R. Eagle, electrical contractor trading at 10 Houghton Chambers, Houghton Place, Liverpool. First and final dividend of 8s. 3d. in £. payable on 21 Mar. at office of E. S. Browne, C.A., 41 N. John St, Liverpool.

*Winding-up*

**M.C.L. Electrical Ltd.** At first meeting of creditors Official Receiver said no statement of affairs had been filed but according to present information liabilities amounted to about £40,280, of which £39,166 was owing to W. J. M. Holdings Ltd. (also in liquidation) and £1,114 to Inland Revenue. There were also thought to be debts due in respect of accountancy fees and to Mr W. J. Merifield (director) personally, but amount of those liabilities was not known. So far as Official Receiver was aware assets comprised an interest in subsidiary company W.E.K. (Electrical) Ltd. (in liquidation), value of which was doubtful, and £43 cash at bank. Company was formed in May 1947, with nominal capital of £5,000, of which 10s. only had been issued. Resolution passed for appointment of Mr T. J. M. MacLeod, C.A., 4 Bucklersbury, London, E.C.4, as liquidator.

# MEETINGS TO NOTE

**THURSDAY, 10 MAR.**

I.E.E. (London). "Electrical Equipment of Toronto Subway Cars." F. W. Roberts. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Scotland). "Special Effects for TV Studio Productions." A. M. Spooner and T. Worswick. Queen's College, Dundee, 7 p.m. Visit of vice-president, Dr Willis Jackson; Tea at Queen's Hotel, 5 p.m.

I.E.E. (Swansea). "Some Design Features of Semi-Outdoor Power Station at Ince." F. H. S. Brown. Elect. Showrooms, Kingsway, 6 p.m.

I.E.E. (Norwich). "Fuel Supplies of Future." D. Hicks. Assembly Hse, 7.30 p.m.

I.E.S. (Manchester). Members' Night. Elect. Offices, Town Hall, 6 p.m.

Derby Electrical Soc. Ten minute papers by junior members. Elect. Offices, Irongate, 7 p.m.

British Instn. of Radio Engrs. (Scottish). "Computing Circuits in Flight Simulators." R. A. Marvin. 39 Elmbank Cresc, Glasgow, 7 p.m.

**FRIDAY, 11 MAR.**

I.E.E. (N. Staffs). "Possibilities of Cross-Channel Power Link between British and French Supply Systems." D. P. Sayers, M. E. Laborde and F. J. Lane. Elect. Showrooms, Stoke-on-Trent, 7 p.m.

I.E.E. (Western). Annual dinner and dance at Grand Spa Hotel, Bristol, 7 p.m.

I.E.S. (Nottingham). Ladies' evening at Victoria Station Hotel.

British Refrigeration Assoc. Banquet at Savoy Hotel, London.

Manchester Assoc. of Engrs. Dinner and dance at Grand Hotel.

**MONDAY, 14 MAR.**

I.E.E. (N. Eastern). "Automatic Circuit Reclosers." G. F. Peirson, A. H. Pollard and N. Core. Neville Hall, Newcastle, 6.15 p.m.

I.E.E. (S. Midland Supply and Utilisation). "Repairing Electrical Plant," J. Ashmore. Imperial Hotel, Birmingham, 6 p.m.

I.E.E. (Western Supply). "Supply to Industry from point of view of Consumer, Commercial Engineer and Distribution Engineer." R. H. Cobbold, W. P. Warren and J. S. Lombard. Elect. Offices, Colston Ave, Bristol, 6 p.m.

I.E.E. (Reading). Open Forum. George Hotel, 7.15 p.m.

I.E.E. (London Students). "Air Transportation." Sir Miles Thomas. Instn. of Civil Engrs., Great George St, S.W.1, 6.30 p.m.

I.E.S. (Sheffield). Paper by Miss H. M. Maurice.

Leicester Electrical Soc. "Interference Suppression." A. Hale. Elect. Offices, Charles St, 7 p.m.

Inst. of Fuel (N. Eastern). "Wind and Solar Energy." Prof P. A. Sheppard. King's College, Newcastle, 6.30 p.m.

A.S.E.E. (Central London). "Space Heating by Electricity." St. Ermin's Hotel, Caxton St, S.W.1, 7 p.m.

**TUESDAY, 15 MAR.**

Electrical Engrs. (A.S.E.E.) Exhibn. Opens at Earls Court continuing until 19 Mar.

I.E.E. (London Measurements). "Mechanisation of Sub-harmonic Generation in Feedback System." J. C. West and J. L. Dorce; "Transient Behaviour of Remote-Position Control Systems with Hard-Spring Non-Linear Characteristic," J. C. West and P. N. Nikiforuk. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (E. Midland). "Possibilities of Cross-Channel Power Link between British and French Supply Systems." D. P. Sayers, M. E. Laborde and F. J. Lane. Elect. Offices, Derby, 6.30 p.m.

I.E.E. (Cambridge Radio). "Caesium Clock." J. G. Yates. Cambridgeshire Tech. College, 6 p.m.

I.E.E. (N. Midland). "Colour Television." G. N. Patchett. Tech. College, Bradford, 6.30 p.m.

I.E.E. (N.W. Utilisation). "Standardisation of Retail Electricity Tariffs." A. O. Johnson and N. F. Marsh. Engrs. Club, Albert Sq, Manchester, 6.15 p.m.

I.E.E. (S.E. Scotland). "Genesis of the Thermionic Valve," Prof G. W. O. Howe; "Thermionic Devices from Development of Triode up to 1939," Sir Edward Appleton; "Developments in Thermionic Devices since 1939," J. Thomson. Carlton Hotel, North Bridge, Edinburgh, 6.30 p.m.

I.E.S. (Liverpool). Members' night. Four papers by W. B. Parkinson, J. R. Parker, G. E. Shepherd, J. A. Watson and C. G. Lloyd. Liverpool Engineering Soc., 9 The Temple, 24 Dale St, 6.30 p.m.

Incorp. Plant Engrs. (S. Wales). "Oil Firing Installations." Engineering Inst., Park Place, Cardiff, 7.15 p.m.

**WEDNESDAY, 16 MAR.**

I.E.E. (London Supply). "Examination of High Voltage a.c. Testing applied to Large Stator Windings." R. T. Rushall and J. S. Simons. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N.W. Radio). "Artificial Reverberation." P. E. Axon, C. L. S. Gilford and D. E. L. Shorter. Engrs. Club, Albert Sq, Manchester, 6.45 p.m.

I.E.E. (Rugby Students). "Communication of Information—Human, Animal and Machine." E. C. Cherry. College of Technology and Arts, 6.30 p.m.

I.E.E. (Southern). "Transatlantic Telephone Cable." M. J. Kelly, Sir W. Gordon Radley, G. W. Gilman and R. J. Halsey. R.A.E. Tech. College, Farnborough, 7.30 p.m.

I.E.S. (N. Lancs). "Simple Measurement of Radiant Energy and Calibration of Light Sources." H. W. Cumming. Joint meeting with A.S.E.E. (Preston). Elect. Offices, 19 Friargate, Preston, 7.15 p.m.

I.E.S. (Tees-side). "Studies in Interior Lighting." J. M. Waldram. Cleveland Scientific and Tech. Inst., Corporation Rd, Middlesbrough, 6.30 p.m.

Women's Engrng. Soc. (Manchester). "Refrigeration." J. S. Porter. Engrs. Club, Albert Sq, 6.45 p.m.

Incorp. Plant Engrs. (Kent). "Industrial Lighting." J. F. Roper. Bull Hotel, Rochester, 7 p.m.

I.E.E. (Bristol Students). "Principle and Application of Discharge Lamps," Messrs Bird and Burbridge. Canteen of Westinghouse Co., Chippenham, 6.30 p.m.

A.S.E.E. (Manchester). "Transducers and their Application to Industry," T. H. Halstead. Engineers' Club, Albert Sq, 7 p.m.

A.S.E.E. (Nottingham). Annual films evening at Elect. Offices, Smithy Row, 7.30 p.m.

A.S.E.E. (S.W. London). Films: "Diesel Story" and "Introduction to the Heat Engine." Guild Hse, Worple Rd, Wimbledon, 8.15 p.m.

**THURSDAY, 17 MAR.**

I.E.E. (London Utilisation and Supply). "Standardisation of Retail Electricity Tariffs." A. O. Johnson and N. F. Marsh. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Eastern). "Possibilities of Cross-Channel Power Link between British and French Supply Systems." D. P. Sayers, M. E. Laborde and F. J. Lane. King's Hall, Globe Lane, Carlisle, 7 p.m.

E.W.F. Annual meeting and dinner. Both at Dorchester Hotel, London.

British Instn. of Radio Engrs. (Scottish). Symposium of Short Papers by Members. University, Edinburgh, 7 p.m.

Chelmsford Engrng. Soc. "Colour TV," L. C. Jesty. Hoffman's Social Hall, 7.30 p.m.

A.S.E.E. (Watford). "Earthing," T. C. Gilbert. Clarendon Hotel, Station Rd, 8 p.m.

**FRIDAY, 18 MAR.**

I.E.E. (N.E. Students). "Some Electronic Applications to Chemical Analysis." M. S. Beck. King's College, Newcastle, 6.30 p.m.

Leicester Electrical Soc. Annual dinner dance at Grand Hotel.

E.P.E.A. (Southern Meter Engrs.). Brains Trust. Caxton Hall, Westminster, 6.30 p.m.

Inst. of Fuel (E. Midland). "Application of Gas Turbines to Industry." Loughborough College, 7.15 p.m.

Inst. of Mechanical Engrs. Annual meeting at 1 Birdcage Walk, S.W.1, 5.30 p.m.

I.E.E. (N. Midland). Annual dinner and dance at Cairn Hydro Hotel, Harrogate, 7.15 p.m.

# NEW COMPANIES

*Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.*

**Dawsons (Bournemouth) Ltd.** 1/2 Sandringham Mansions, Exeter Rd, Bournemouth. To take over business of electrical and mechanical engineers carried on at "Dawsons of Bournemouth" at Midland Rd, Winton, Bournemouth. Nom. cap.: £2,000. Dirs.: H. Dawson and Pearl H. Dawson.

**H. Hersh and Co., Ltd.** 50a Thomas St, Manchester 4. Electrical and electronic engineers, etc. Nom. cap.: £100. Dirs.: H. Hersh and Stella Hersh.

**V. L. Martin and Co., Ltd.** Central Hall Buildings, South Rd, Southall, Middx. To take over business of electrical engineer carried on at Southall, Middlesex, by Vincent L. Martin. Nom. cap.: £3,000. Dirs.: V. L. Martin and Margaret Martin.

**William Camm and Co., Ltd.,** 12 Middle Pavement, Nottingham. Electrical engineers and contractors, etc. Nom. cap.: £100. Dirs.: W. G. Camm and D. F. Camm.

**Amazon Insulation Co., Ltd.** Amazon, Cubitts Yacht Basin, Hartington Rd, Chiswick, W.4. Manufacturers of and dealers in aerated concrete, rubber latex, and plastic, cellular and insulation materials, builders of cold stores and refrigeration equipment, etc. Nom. cap.: £1,500. Dirs.: H. E. Evans, Mrs E. B. Evans and Myfanwy Prys.

**Cathora Ltd.** 44 Bavaria Rd, N.19. Electricians, radio and television engineers, etc. Nom. cap.: £100. Dirs.: R. R. Bell, Mrs D. I. Bell, and J. F. Archer.

**Alfred Day (Electrical and Television Contractors) Ltd.** 161 Love Lane, Heaton Norris, Stockport. To take over business of electrical contractor carried on at Heaton Norris, Stockport. Nom. cap.: £500. Dirs.: Peggy F. Day and A. Fitton.

**Sinograt Ltd.** Manufacturers of and dealers in electrical and optical instruments and components, vacuum or gas filled devices, scientific instruments, etc. Nom. cap.: £1,000. Dirs.: not named. Subs.: H. W. Thorn and J. C. Leck, 6/8 Sackville St, W.1.

**Luff and Smith (Designs) Ltd.** 3 Station Approach, Kew Gardens, Surrey. Mechanical, electrical, aeronautical, marine and electronic designers and engineers, etc. Nom. cap.: £1,000. Dirs.: J. Ramsden, L. Brown and W. J. Sanderson.

**Potten and Sons Ltd.** 32/4, Borough High St, S.E.1. Mechanical, electrical, chemical and general engineers, etc. Nom. cap.: £100. Dir.: J. Potten.

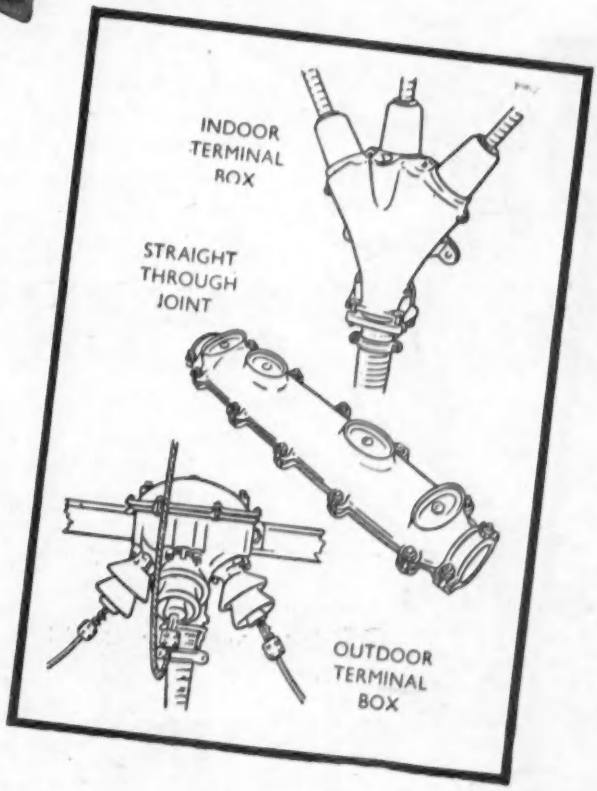
Henley's provide a dependable range of distribution equipment for indoor and outdoor installations.

Examples of equipment for 3,300 to 11,000 volts are illustrated below. Please write for catalogues in which you are interested.

**Catalogue 31**
**Straight Through Joints**

**Catalogue 32**
**Indoor Terminal Boxes**

**Catalogue 33**
**Outdoor Terminal Boxes (Inverted)**




# HENLEY

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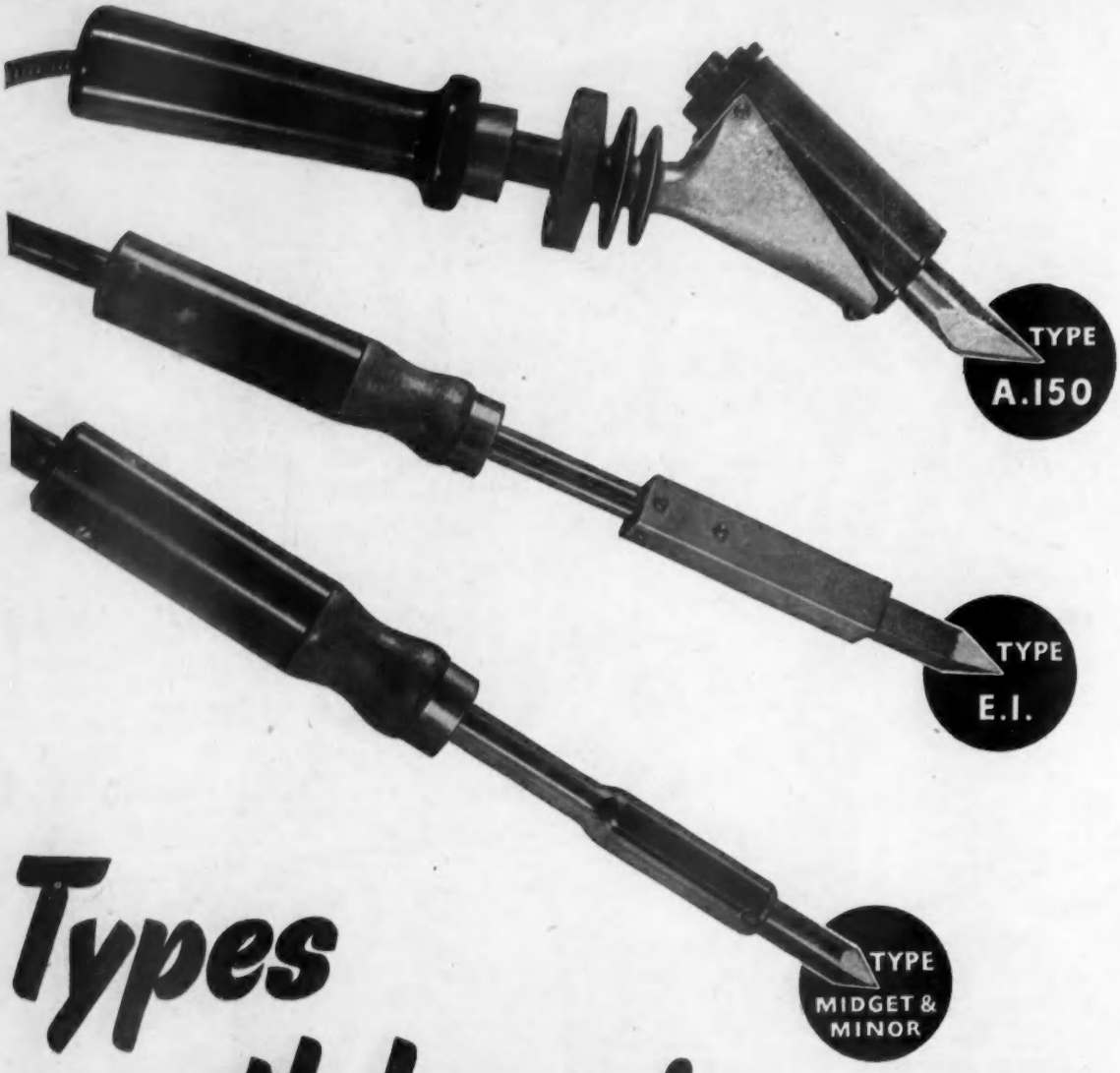


# Types worth knowing

We invite you to visit us on
STAND No. 95 at the
A.S.E.E. Exhibition
at Earls Court
15th - 19th March

British made throughout, the Browleco Electric Soldering Irons are solidly built to stand plenty of hard wear. All parts are renewable and quickly fitted. All Browleco irons are covered by our Guarantee against electrical breakdown for a period of six months Write for leaflet.

**GRAngewood 4003 (4 lines)**

## BROWNING'S ELECTRIC CO., LTD.

**BOLEYN CASTLE, UPTON PARK, LONDON, E.13**

# CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

## TENDERS INVITED

### BOROUGH OF YEOVIL

PUBLIC LIGHTING SCHEME 1955—56

TENDERS are invited for the provision and erection of 15 feet mounting height steel columns for electric street lighting, complete with lanterns, lamps and equipment for 37 No. 80 W mercury vapour lamps and 37 No. 100 W tungsten lamps. Contract documents may be obtained from and drawings inspected at the office of the undersigned.

Sealed tenders, in the official envelope provided, must reach the Town Clerk not later than 10 a.m. on Wednesday, 30 Mar., 1955.

The Council do not bind themselves to accept the lowest or any tender.

A. HEAL, M.I.MUN.E.,
Borough Surveyor.

Municipal Offices, King George St, Yeovil. (R 147)

## APPOINTMENTS VACANT

*Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.*

### MANCHESTER CITY ARCHITECT'S DEPARTMENT

APPLICATIONS are invited for the appointment on the permanent staff of a SENIOR ELECTRICAL ENGINEER. Salary Grade A.P.T.IV, £675/£825 per annum. Applicants must be Associate Members of the Institution of Electrical Engineers and be experienced in the preparation of schemes for electrical light and power installations in all classes of buildings.

Further particulars and forms of application may be obtained from the City Architect, Box No. 488, Town Hall, Manchester 2. The completed form to be returned to the same address by 28 Mar., 1955. Canvassing is prohibited. (R 168)

### BRITISH ELECTRICITY AUTHORITY
**Midlands Division**

GENERAL ASSISTANT ENGINEER is required in the Protective Gear Section of the Technical Department. N.J.B. service conditions, superannuable appointment, salary within Schedule C, Grade 6, commencing in range £600/£725, ultimately rising to £785 per annum.

A university degree, Higher National Certificate or equivalent qualification is desirable. Some knowledge of protective gear is required, and preferably experience with a switchgear manufacturer.

Apply on Form AE6, quoting vacancy number 901MD, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 26 Mar., 1955. (R 164)

### THE NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF DISTRICT COMMERCIAL ENGINEER, LUNE DISTRICT, LANCASTER

DUTIES will include organisation and control of all commercial staff and functions in the District: supply of information and advice to consumers on electricity utilisation, tariffs, terms, apparatus and all matters concerning electricity services; organisation and supervision of maintenance work on consumers' premises including emergency service, routine testing and repair of domestic appliances; control of Service Centres and Exhibitions; supervision of consumer records.

Salary Scale: £1,035 x £30—£1,125 per annum, Grade F.2, N.J.B. Conditions.

Applications to the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune St, Preston, by 19 Mar., 1955. (R 134)

### WAR OFFICE

VACANCIES exist for mechanical and electrical engineering draughtsmen in the designs branch of the Directorate of Fortifications and Works, War Office, Chessington, Surrey.

MECHANICAL DRAUGHTSMEN—(H. and V.)—Applicants must have knowledge and experience of design of low-pressure hot water heating and domestic hot water supply installations. O.N.C. in Mechanical Engineering or equivalent is essential.

ELECTRICAL ENGINEERING DRAUGHTSMEN—Applicants must have several years' experience in the preparation of schemes for the illumination and electrical equipment of buildings or in electrical distribution H.V. and M.V. O.N.C. in Electrical Engineering or equivalent is essential.

Applicants must be British of British parentage.

Salary range is £432 (at 21)—£680 plus overtime. Starting pay according to age, qualifications and experience, with annual increases subject to satisfactory service. Prospects of promotion and establishment. Canteen facilities.

State age, full details of training and experience to Secretary of State for War, War Office (C.5.A), R. 503 Northumberland House, London, W.C.2. (R 149)

### IMPERIAL COLLEGE

DEPARTMENT OF ELECTRICAL ENGINEERING

APPLICATIONS are invited for two LECTURESHIPS from 1 Oct., 1955. Candidates should possess a good honours degree in Electrical Engineering and preferably have completed a Graduate Apprenticeship or have had similar industrial experience. Salary within range £700 x £50—£1,000 and upwards, according to qualifications and experience, with F.S.S.U. and Family Allowances. Duties will include Undergraduate and Post-graduate teaching and the undertaking of research.

Applications, stating age, academic qualifications and experience, with the names of two referees should reach the Head of the Department, Imperial College, London, S.W.7, by 18 Apr., 1955. (R 170)

### SIR CHARLES COLSTON
**Limited**

A Company, with very considerable financial resources, has been formed by Sir Charles Colston. It will manufacture modern electrical domestic labour saving appliances.

A management team is now being set up and applications from men of outstanding vision, energy, ability and experience are invited to direct the following departments:

RESEARCH & DEVELOPMENT

PRODUCTION

SALES

ADMINISTRATION

The required standard is very high and salaries and opportunities will be commensurate.

Factory space is being sought in any part of Great Britain and the Company may be interested in acquiring factories engaged in light engineering as going concerns.

All applications, which should give full details of past career and achievements and which will be treated in the strictest confidence, to

**Sir Charles Colston,**
**c/o Dorland Advertising Ltd.,**
**18/20 Regent Street, London, S.W.1.**

(R 159p)

### BRITISH ELECTRICITY AUTHORITY
**North West, Merseyside & N. Wales Division**

VACANCY No. E.86/74/T.—STATION SHIFT CONTROL ENGINEER, Stockport Generating Station. Salary £635/£680 (F.10).

Vacancy No. E.86/80/T.—MAINTENANCE ENGINEER (Electrical), Westwood Generating Station. Salary £840/£900 (G.6).

Vacancy No. E.86/82/T. — SHIFT CHARGE ENGINEER, Connah's Quay Generating Station. Salary £790/£850 (G.7).

Apply to Divisional Secretary, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 19 Mar. Quote vacancy No. (R 150)

### BRITISH ELECTRICITY AUTHORITY
**Eastern Division**

APPLICATIONS are invited for the following posts:

ASSISTANT ENGINEERS (OPERATION) GOLDINGTON GENERATING STATION, NR. BEDFORD

Salary Class G, Grade 12, £595 x £15—£640 per annum eventually rising to Class H, £635 x £15—£680 per annum.

The duties will involve the supervision and control of boiler/turbine units, on a shift basis.

Candidates should have had experience in the operation of modern, land or marine boiler and Turbine Plant. Technical qualifications and training in combustion and/or steam utilisation efficiency control will be an advantage.

The Station, at present under construction, will comprise six unitised turbo-alternators and P.F. boilers, each of 30 MW capacity.

Applications stating age, qualifications and experience should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than 19 Mar., 1955.

W. N. C. CLINCH,
Controller.

(R 138)

**THE NORTH EASTERN ELECTRICITY BOARD**
**Wear Sub-Area**

APPLICATIONS are invited for the appointment of DISTRICT ENGINEER, Hesledon District. Applicants must be qualified electrical engineers with sound practical training and considerable experience in the construction, operation and maintenance of overhead and underground networks and associated plant equipment. Salary—Schedule A, Class E, Grade 2—£975/£1,050. N.J.B. conditions of service. Applications stating age, qualifications and experience should be forwarded to the Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (R 169)

**BRITISH ELECTRICITY AUTHORITY**
**Midlands Division**

SHIFT CHARGE ENGINEERS are required at Meaford "B" Power Station. N.J.B. service conditions, superannuable appointments, salary within Schedule A, Grade G7, commencing at £790 per annum, rising to £850 per annum.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear are required. Appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 905MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 26 Mar. 1955. (R 165)

**SOUTH WESTERN ELECTRICITY BOARD**
**Taunton Sub-Area**

APPLICATIONS are invited for the post of

JOINTER (E.H.T.)

Wages and conditions of employment in accordance with N.J.I.C. Agreement for employees in the Electricity Supply Industry. Applications in writing to the Sub-Area Manager, Electricity House, The Parade, Taunton, within seven days of the appearance of this notice. (R 139)

**LONDON ELECTRICITY BOARD**
DISTRICT COMMERCIAL ENGINEERS

APPLICATIONS are invited for the appointment of District Engineers in the Leyton and Forest districts of the North Eastern Sub-Area.

The successful candidates will be responsible for the commercial organisation and development of the Districts, and applicants should have had experience in commercial development of electricity supply; control of Service Centres, sales and staff; administration and operation of hire and hire purchase schemes, and the control of an electrical contracting and maintenance department and staff.

The posts are graded under Schedule "A" of the National Joint Board agreement as Class E, Grade 3—£945 per annum, rising to £1,023. 15s. per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46/7 New Broad St, E.C.2, to be returned completed by 24 Mar., 1955. Please enclose addressed envelope and quote ref.: V/1866/1923/T. (R 160)

**BRITISH ELECTRICITY AUTHORITY**
**Midlands Division**

SHIFT CHARGE ENGINEER is required at Stafford Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade B7, commencing salary £595 rising to £640 per annum.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear are required. Appropriate technical qualifications will be an advantage. Qualified marine engineers with electrical experience would be considered suitable.

Apply, quoting Vacancy No. 899MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 26 Mar., 1955. (R 162)

**IMPERIAL CHEMICAL INDUSTRIES LIMITED**
**Wilton Works**
ENGINEERS

FEW postwar industrial developments have been conceived on the scale of continuous expansion of the Wilton Works of Imperial Chemical Industries.

This modern factory provides opportunity for young men of ability in many fields of engineering. Previous experience in the chemical industry is not essential but applicants should have one or more years' industrial experience including practical training, and men with a good Honours Degree are preferred. There are openings in most engineering fields including design and layout, construction, plant operation and maintenance for Mechanical and Electrical Engineers, who will find ample scope for promotion leading to executive positions.

Appointments are to the permanent staff with first-class working conditions including Pension Fund and Recreation facilities.

Write for application form to Staff Officer, Imperial Chemical Industries Ltd., Wilton Works, Middlesbrough, Yorkshire, quoting advertisement ref. ICI/X/204/C. (R 50)

**MIDLANDS ELECTRICITY BOARD**

APPLICATIONS are invited for the following superannuable posts:

**Central Gloucestershire Sub-Area**

GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER (DEAN FOREST DISTRICT)

Duties will include advising consumers in respect of domestic and commercial electrical equipment, estimating and contracting work. Sound knowledge of electrical installation practice together with good commercial ability is necessary. Technical qualifications desirable. Salary £515/£560 per annum (N.J.B. Grade D.11) according to qualifications and experience.

ASSISTANT WAYLEAVE OFFICER (STROUD DISTRICT)

Duties to include assistance in simple survey and plotting of routes for proposed overhead lines. Salary £425/£525 per annum (N.J.C. Grade 1). Experience desirable.

Apply, in writing, within fourteen days, stating age, experience, present position and salary, to Mr D. Holt, Sub-Area Manager, Midlands Electricity Board, 126 London Rd, Gloucester.

**Wolverhampton and District Sub-Area**

GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER (WALSALL DISTRICT)

Duties will include advising consumers in respect of domestic and commercial electrical equipment; estimating, contracting work and radio and TV service. Salary £595/£640 per annum (N.J.B. Grade F.11).

Apply, in writing, within fourteen days, stating age, qualifications, experience, present position and salary, to Mr F. J. Elliott, Sub-Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

A. STEPHENS,
Secretary.
(R 182)

**BRITISH ELECTRICITY AUTHORITY**
**South Western Division**
TECHNICAL STAFF VACANCIES

(*a*) STATION SHIFT CONTROL ENGINEER—East Yelland Generating Station, N.J.B. Class G, Grade 10, £675/£720.

(*b*) SENIOR DRAUGHTSMAN (Electrical)—Transmission Department, N.J.B. Schedule D, Grade 5, £640/£740. Superannuation.

For (*a*) applicants should possess good technical qualifications, and have had training and experience in the control and operation of steam generating plant and main switchgear.

Closing date, 21 Mar., 1955.

(*b*) Duties mainly comprise preparation of schematic and detail diagrams of control protection and metering equipment associated with H.V. Substation construction. Experience of switchgear and cable layouts an advantage.

Closing date, 26 Mar., 1955.

Applications on Form A.E.6/A.C.T., obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8. (R 152)

**BRITISH ELECTRICITY AUTHORITY**
**East Midlands Division**

APPLICATIONS are invited for the following positions within the Division:

JUNIOR ENGINEERS, FREEMEN'S MEADOW POWER STATION, LEICESTER
Vacancy No. 40/55/ET

Some experience in Control Room and Boiler House work in a large P.F. Station is required. Technical qualifications up to H.N.C.

Salary in accordance with Class H, Grade 16, (£475 x £15—£520 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 21 Mar., 1955.

JUNIOR ENGINEER
WARWICK POWER STATION
Vacancy No. 41/55/ET

Applicants should have had training and experience in Power Station operation and hold some qualification.

Salary will be in accordance with Class E, Grade 13 (£475 x £15—£520 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 21 Mar., 1955.

THIRD ASSISTANT ENGINEER (ELECTRICAL) GENERATION (CONSTRUCTION), CASTLE DONINGTON POWER STATION SITE
Vacancy No. 42/55/ET

Applicants should have had a fundamental training in electrical engineering, including workshops, and should preferably have had experience in the manufacture, erection and maintenance and operation of electrical plant as installed in modern Power Stations. Preference will be given to candidates who possess a Degree or are Graduate Members of the Institution of Electrical Engineers.

Salary will be within Schedule C, Class AX/DX, Grade 4 (£750/£950 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 28 Mar., 1955.

STATION SUPERINTENDENT, CASTLE DONINGTON POWER STATION
Vacancy No. 43/55/ET

Applications are invited for the position of Power Station Superintendent at Castle Donington, now under construction.

Candidates must have served a recognised engineering apprenticeship and have had a wide experience in a responsible position in the administration, operation and maintenance of a modern high pressure P.F. Power Station.

It is desirable that applicants should possess qualifications admitting to Corporate Membership of the I.E.E. and/or I.Mech.E.

The salary will be in accordance with Scale 4 of the National Joint Managerial and Higher Executive Grades (£1,600/£1,750 per annum) and conditions of service those agreed by that Committee.

Closing date for receipt of applications, 28 Mar., 1955.

STATION SHIFT CONTROL ENGINEERS CASTLE DONINGTON POWER STATION
Vacancy No. 46/55/ET

Candidates should be in possession of the Higher National Certificate in electrical and/or mechanical engineering and have had experience in the control and load despatching of large capacity steam generating plant connected to the National Grid System.

Salary will be in accordance with Class L, Grade 10 (£840 x £20—£900 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 28 Mar., 1955.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
(R 167)

## EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

**Northmet Sub-Area**

ST. ALBANS DISTRICT
SENIOR SALES REPRESENTATIVES (2)
(Ref. 514) 36/55.R.

Candidates must be of good address and have had sound practical training, with experience in electrical installation work for domestic, commercial and industrial premises. A good knowledge of electric water heating and ability to prepare wiring specifications and estimates is essential.

Salary in accordance with Grade 2 (£525 x £20—£585) of the National Joint Council Agreement.

Apply to the District Manager, Eastern Electricity Board, 107 St. Peter's St, St. Albans, Herts.

**Sub-Area Headquarters, London, N.14**

(i) 2ND ASSISTANT ENGINEER (CONSTRUCTION)
(Ref. 530) 35/55.R.

(ii) SENIOR DRAUGHTSMEN TWO)
(Ref. 531) 37/55.N.

(iii) ENGINEERING DRAUGHTSMAN
(Ref. 531) 38/55.N.

Candidates for (i) should be trained Electrical Engineers with adequate experience to assist the Senior Assistant Engineer (Construction) in all aspects of the organisation and control of cable laying, jointing and overhead line erection, including testing and fault localisation, with direct and contract labour at all voltages up to 33 kV.

Candidates for (ii) should have had experience of Building and Civil Engineering work for substations, service centres, workshops, offices, etc. The successful candidates will be required to supervise staff engaged on the preparation of drawings for 33 kV substations, should be capable of the design of simple reinforced concrete structures and be able to carry out site surveys. A knowledge of the use of a theodolite would be an advantage.

For appointment (iii) candidates should have had a good technical training and experience in the preparation of plans and detailed drawings of Building and Civil Engineering work including substations, service centres, workshops, offices, etc.

The salary for all these appointments will be in accordance with the National Joint Board Agreement as follows:

(i) Class M, Grade 7, commencing at £1,110 plus London Allowance.
(ii) Schedule D, Grade 5, £640/£740, plus London Allowance.
(iii) Schedule D, Grade 6, £510/£630, plus London Allowance.

Apply for these appointments to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet Hse, Southgate, London, N.14.

BISHOPS STORTFORD DISTRICT
3RD ASSISTANT ENGINEER
(Ref. 479) 34/55.R.

Candidates should have had a sound training in electrical engineering and suitable experience in the construction, operation and maintenance of underground and overhead systems, including substations. Housing accommodation is available in Harlow New Town.

Salary in accordance with Class D, Grade 9, of the National Joint Board Agreement, commencing at £595.

Apply to the District Manager, Eastern Electricity Board, 25 North St, Bishops Stortford, Herts.

GENERAL ASSISTANT ENGINEERS

Required in the following localities:

(a) Aylesbury District, Chilterns Sub-Area (Two Appointments). 30/55.R.
(b) Tottenham District, Northmet Sub-Area. (Ref. 521) 32/55.R.
(c) Hertford District, Northmet Sub-Area. (Ref. 534) 41/55.N.
(d) Enfield District, Northmet Sub-Area. (Ref. 535) 42/55.N.
(e) Wood Green District, Northmet Sub-Area). (Ref. 537) 33/55.R.

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.

Salary for all these appointments will be

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in accordance with Grade 11 of the National Joint Board Agreement, as follows:

(a) and (c) Class E, commencing at £555.
(b) Class E, commencing at £555, plus London Allowance.
(d) and (e) Class F, commencing at £595, plus London Allowance.

Apply to the District Manager, Eastern Electricity Board, at the following addresses:

(a) Exchange St, Aylesbury, Bucks.
(b) 312 High Rd, Tottenham, London, N.15.
(c) Bridgefoot, Ware, Herts.
(d) 40 Church St, Enfield, Middlesex.
(e) 13/27 Station Rd, Wood Green, London, N.22.

Future salary and conditions of service for all the above appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, by letter, stating age, education, and experience with details of present appointment and salary, should be submitted to the Manager concerned within fourteen days of the appearance of this advertisement. (R 180)

## BRITISH ELECTRICITY AUTHORITY
### London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedules A or C. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for posts (a) and Corporate Membership for posts (b) an advantage.

(b) POWER STATION SUPERINTENDENT
DEPTFORD WEST GEN. STATION
Repeat Vacancy No. 55/57

The person appointed will be responsible for the general management and operation of the Station. Candidates should have received a sound technical training with wide practical experience in Electrical and Mechanical Engineering and in Power Station practice. Salary—N.J.M. Agreement, Scale 2=£1,350—£1,500 per annum.

(a) ASSISTANT ENGINEER (MECHANICAL)
GROVE ROAD GEN. STATION
Repeat Vacancy No. 55/78

Successful candidate will be required to take charge of drawing office works, lifting tackle tests and records and to assist generally. Salary, Class F, Grade 11= £674. 15s. per annum.

Previous applicants for the above vacancies will be considered and need not reapply.

(a) GENERAL ASSISTANT ENGINEER
(ASSISTANT SECTION ENGINEER)
TRANSMISSION DEPARTMENT
Vacancy No. 55/189

Candidates should have a wide experience in the operation and maintenance of high voltage transmission equipment. Salary, Class AX/EX, Grade 5=£708. 15s./ £924. 5s. per annum.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (R 151)

## BRITISH ELECTRICITY AUTHORITY
### Midlands Division

THIRD ASSISTANT ENGINEER (Control) is required in the System Operation Department at Divisional Headquarters, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule C, Grade 4, commencing in range £750/£875, ultimately rising to £975 per annum.

Applicants should have had a sound technical training and practical experience in connection with system control. The possession of appropriate technical qualifications and experience within a power station will be considered advantages.

Apply, quoting Vacancy No. 898MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 26 Mar., 1955. (R 163)

## SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT ENGINEER—FOLKESTONE DISTRICT

SALARY £635/£680 under N.J.B. Class D, Grade 8. Superannuable. Applicants must have had a sound practical training and experience in the design, construction, operation and maintenance of H.V. and M.V. Overhead and Underground distribution systems, substation plant and ancillary equipment and preferably hold the Higher National Certificate, or its equivalent in Electrical Engineering. The person appointed will be required to reside in the District and accommodation is available.

Applications, naming 2 referees, to P. V. Gurr, J.P., District Manager, SEEBoard, York House, Cheriton Gardens, Folkestone, Kent, by 23 Mar., 1955.

JOINTER (EXTRA HIGH TENSION)—CRAWLEY DISTRICT

Wages 4s. 1d. per hour for 44-hour, 5-day week under N.J.I.C. Agreement. It is possible that housing accommodation can be provided.

Applications, naming 2 referees, to F. A. Avery, A.I.E.E., District Manager, Crawley District, SEEBoard, 55 High St, Crawley, by 23 Mar., 1955.

JUNIOR ENGINEER—PURLEY DISTRICT

Salary £475 per annum under N.J.B. Class E, Grade 13, plus London Area Allowance. Superannuable. Applicants to hold the Higher National Certificate for Electrical Engineering or equivalent, and have had training and experience in Underground and Overhead Distribution.

Applications, naming 2 referees, on forms from J. McAllister, B.SC., A.M.I.E.E., Purley District Manager, SEEBoard, Electric House, High St, Purley, by 23 Mar., 1955.

A. L. BURNELL,
Secretary.
(R 166)

## BRITISH ELECTRICITY AUTHORITY
### Yorkshire Division

require a SECOND ASSISTANT STATION CHEMIST at Doncaster "B" Power Station. This station will have an ultimate capacity of 120 MW.

Salary £595/£640 per annum, Class F, Grade 11, N.J.B. Agreement.

Applicants should hold Higher National Certificate in Chemistry or its equivalent and have had previous experience associated with the analysis and testing of fuels, waters and oils. Preference will be given to those candidates having Power Station experience particularly associated with modern water treatment plants.

Application forms obtainable from Divisional Secretary (Establishments), British Electricity House, St. Mary's Rd, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(R 183)

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SYSTEM CONTROL ENGINEER required in the No. 4 Sub-Area Operation Department based on the Control Centre at Legacy, near Wrexham. Salary £755/£800 per annum (N.J.B. J/10).

Duties, which will be on a shift basis, will be those normally associated with switching operations and load transfers on an extensive E.H.V. system inter-connecting 132/ 33 kV injection points and a number of hydro-electric stations.

Applicants should have had operational experience in distribution work and in substations. Possession of the technical qualifications necessary to enable them to become Chartered Electrical Engineers advantageous.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager, Merseyside and North Wales Electricity Board, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. (R 22)

**Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2**

## YORKSHIRE ELECTRICITY BOARD

### No. 4 (Leeds) Sub-Area

THIRD ASSISTANT ENGINEER (CONSTRUCTION)

APPLICANTS must be experienced in supervising underground and overhead system construction at all voltages up to and including 33 kV and be competent to programme work and deal with technical correspondence.

Knowledge of overhead line survey is necessary and experience on a large city network is desirable.

Applicants must be corporate members of the Institution of Electrical Engineers or hold equivalent qualifications.

Salary—N.J.B. Class K, Grade 10, £790/£20/£850 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 24 Mar., 1955.

### No. 7 (Grimsby) Sub-Area

Scunthorpe District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants should be preferably Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications, and should have experience in the design, construction, operation and maintenance of H.V. and L.V. Overhead and Underground Distribution Systems, Substation plant and ancillary equipment.

Salary—N.J.B. Class F, Grade 9, £675/£15/£720 per annum.

Gainsborough District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants should be preferably Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications, and should have experience in the design, construction, operation and maintenance of H.V. and L.V. Overhead and Underground Distribution Systems, Substation plant and ancillary equipment.

Salary—N.J.B. Class D, Grade 9, £595/£15/£640 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 24 Mar., 1955.

### No. 5 (Wakefield) Sub-Area

Barnsley District

GENERAL ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district and undertake standby duties.

Applicants must hold at least the Higher National Certificate in Electrical Engineering.

Salary—N.J.B. Class F, Grade 11, £595/£15/£640 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 24 Mar., 1955.

### No. 6 (Hull) Sub-Area

Bridlington District

THIRD ASSISTANT DISTRICT ENGINEER (DRIFFIELD)

Applicants should have had a sound practical training with experience in the construction, operation and maintenance of H.V. and L.V. Overhead and Underground Distribution Systems, Substation plant and ancillary equipment.

Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent qualifications.

The successful candidate will be required to reside in Driffield and undertake standby duty.

Salary—N.J.B. Class D, Grade 9, £595/£15/£640 per annum.

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Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston-upon-Hull, not later than 24 Mar., 1955.

### No. 3 (Sheffield) Sub-Area

ENGINEERING DRAUGHTSMAN

Applicants should be able to prepare, under supervision, final layout building and civil engineering drawings connected with the erection and equipment of Electricity Distribution Substations.

Entry into the grade will be according to capabilities and experience.

Salary—N.J.B. Schedule D, Grade 6, £510/£20/£630 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 24 Mar., 1955. (R 171)

## BRITISH ELECTRICITY AUTHORITY

### Southern Division

APPLICATIONS are invited for the following positions:

DEPUTY STATION SUPERINTENDENT, MARCHWOOD GENERATING STATION (480 MW when completed). S/13.634.

Applicants should have received a thorough technical and practical training followed by wide experience in the operation and maintenance of generating station plant and have also held a position of responsibility involving the control of technical and administrative staffs. Preference will be given to corporate members of one of the senior professional engineering institutions, or those holding similar qualifications.

Salary N.J.B. Grade K.3, £1,295 x £35—£1,400.

ASSISTANT ENGINEER (INSTRUMENTS), MARCHWOOD GENERATING STATION S/13.635

Candidates should have previous experience of modern generating station plant and a sound knowledge of instruments and other measuring apparatus used in generating stations.

Applicants should have had a sound technical training and should possess qualifications leading to corporate membership of an appropriate professional institution, or hold equivalent qualifications.

Salary N.J.B. K.10, £790 x £20—£850.

MAINTENANCE SUPERINTENDENT, COWES GENERATING STATION S/13.636

Applicants should have experience in the maintenance of modern generating station plant and be capable of taking control of maintenance staff and supervising turbine and boiler overhauls. Preference will be given to those possessing qualifications leading to corporate membership of a recognised professional institution.

Salary N.J.B. E.6, £755 x £15—£800.

JUNIOR ENGINEERS S/13.637

Applicants should have served an apprenticeship or had practical training suitable to the industry. They should possess a sound general and technical education and preference will be given to those possessing a Higher National Certificate (or those nearing completion of H.N.C. courses). Opportunities are available for junior engineers to complete their studies and gain wide experience with good prospects of promotion.

The duties of those appointed will vary, but will include as a general rule, the operation and control, under supervision, of generating plant.

Vacancies also exist for those who wish to specialise in maintenance of electrical and mechanical generating plant, transmission lines, substations and cables, or generating station construction work.

Salary N.J.B. £475/£590.

Special application forms for each of the above posts, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 23 Mar. Please quote reference E.T. (R 181)

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments which are superannuable and subject to medical examination, from suitable candidates, preferably with the technical qualifications to enable them to become Chartered Electrical Engineers.

### No. 1 Sub-Area

GENERAL ASSISTANT ENGINEER in the Technical Section, No. 1 Sub-Area Headquarters, 24 Hatton Garden, Liverpool 3. Salary £715/£760 per annum (N.J.B. L/13). Practical experience in the commissioning of protective systems advantageous. Duties include the testing of relays and protective gear, H.V. and transformer testing, including site testing. Application forms obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3. Closing date: 21 Mar., 1955.

### No. 2 Sub-Area

ASSISTANT SECTION ENGINEER, Northwich District. Salary £635/£680 per annum (N.J.B. E/9). Preference will be given to candidates with experience in overhead and underground distribution work. Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Nr. Northwich, Cheshire. Closing date: 21 Mar., 1955.

### No. 4 Sub-Area

(*a*) SECTION ENGINEER based on Ruthin.

(*b*) SECTION ENGINEER based on Crewe.

Salaries £715/£760 per annum (N.J.B. E/7).

Applicants should have experience in all branches of work associated with design, construction and operation of Overhead and Underground Distribution Systems at voltages up to 33 kV, including indoor and outdoor substation equipment.

(*c*) ASSISTANT SECTION ENGINEER based on Ruthin.

(*d*) ASSISTANT SECTION ENGINEER based on Nantwich.

Salaries £635/£680 per annum. (N.J.B. E/9).

(*e*) ASSISTANT SECTION ENGINEER based on Aberystwyth.

Salary £555/£600 per annum. (N.J.B. C/9).

Applicants should have had experience in Overhead and Underground Distribution Work.

Application forms for posts in No. 4 Sub-Area obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, Nr. Wrexham. Closing date: 21 Mar., 1955. (R 137)

## BRITISH ELECTRICITY AUTHORITY

### Midlands Division

GENERAL ASSISTANT ENGINEER is required in the Telecommunications Section of the Technical Department. N.J.B. service conditions, superannuable appointment, salary within Schedule C, Grade 6, commencing in range £600/£725, ultimately rising to £785 per annum.

The minimum technical qualification required is the Higher National Certificate in Electrical Engineering, or its equivalent. Preference will be given to candidates who have had experience with telecommunication equipment.

Apply, quoting Vacancy No. 900MD, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 26 Mar., 1955 (R 161)

MECHANICAL AND ELECTRICAL ENGINEER. Applications invited from M. and E. Engineers fully qualified to take charge of a large plant organisation on a Contract, extending over a period of years. Complete charge of personnel, maintenance and repairs of heavy excavating plant, powered by Electricity and Diesel. Previous experience with a Civil Engineering Contractor an advantage. Applications in confidence to—Box No. 4357, Electrical Times. (R 188)

**THE ENGLISH ELECTRIC COMPANY LIMITED**

**Stevenage, Hertfordshire**

are seeking the services of

a fully qualified

SENIOR ENGINEER

He will be required to head a team of development engineers engaged on the development of hydraulic equipment and servo systems.

The successful applicant must have appropriate membership of the professional institutions, preferably with a degree together with considerable experience in leading a team of development engineers and drawing office staff.

This post offers excellent opportunities together with housing assistance and excellent salary. Please apply, quoting Ref. No. 844L, to Dept. C.P.S., 336/7 Strand, W.C.2. (R 53p)

AIR MINISTRY Works Designs Branch requires in London and Provinces (with liability for overseas service) ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in preparation of schemes for illumination and electrical equipment of buildings or in electrical distribution H.V. and M.V. Technical training to O.N.C. standard or equivalent an advantage. Salaries up to £810 per annum starting pay dependent on age, qualifications and experience. Overtime or extra duty allowance payable. Posts non-pensionable with long-term possibilities. Natural-born British subjects only. Write stating age, qualifications, employment details including type of work done to Ministry of Labour, 236 Walworth Rd, London, S.E.17, quoting Order 85/BD. (R 131)

AN ELECTRICAL DESIGNER of rotating electrical machines required. It is essential that applicants have comprehensive experience in the design of high-frequency inductor alternators up to 1,000 kW for furnace heating. Salary commensurate with qualifications; good prospects. Apply to The Chief Engineer, Lancashire Dynamo and Crypto Ltd., Trafford Park, Manchester 17. (R 46)

**THE ELECTRIC CONSTRUCTION COMPANY LIMITED**

**Bushbury Engineering Works**

**Wolverhampton**

Applications are invited for the position of SALES ENGINEER for the Bristol and West of England area. Applicants should have sound technical training and wide experience of Medium and Heavy Electrical Engineering plant, including Machines, Switch and Control Gear, Rectifiers and Transformers.

The position is a salaried one, and the applicant would participate in profit-sharing and Pension Schemes operated by the Company.

Please write, giving full details of training and experience and when available for interview, addressed to the Managing Director at the above address, marked in the top left-hand corner "Bristol." (R 143p)

AN ELECTRICAL DESIGNER for Rotating electrical machines is required by South Wales manufacturers. Applicants should possess a Degree or H.N.C. or equivalent, and have had considerable experience in rotating machine design.

The appointment is a senior one, and the successful applicant will be responsible to the Chief Engineer. The position carries an attractive salary, together with a non-contributory pension scheme. Apply—Box No. 4347, Electrical Times. (R 176)

AN EXPERIENCED D.C. DESIGNER capable of using his initiative required for interesting work on dynamo electric machines from 5 to 5,000 h.p./kW. A superannuation scheme in operation and the usual social amenities available in an organisation of progressive outlook. All applications will be treated with the strictest confidence and should be addressed to the General Manager, Lancashire Dynamo and Cryto Ltd., Trafford Park, Manchester 17. (R 95)

ARMATURE WINDER FOREMAN required for N.E. Scotland repair shop—Council House available—must be accustomed to A.C. and D.C. repairs up to 200 H.P. Good conditions for suitable applicant. Dow and Nicholson Ltd., 10 Wellington Place, Aberdeen. (R 174)

ASSISTANT ELECTRICAL ENGINEER required in London area for work in connection with the design of electrical installations for all types of buildings. Previous consulting or contracting experience desirable and ability to draw and prepare specifications essential. Write giving age, full details of experience and salary required to Box E.T. 214, LPE, 55 St. Martin's Lane, London, W.C.2. (R 121)

BRANCH MANAGER required by well-known London firm of electrical engineers. Knowledge of electrical installation and motor repairs essential.—Box No. 4295, Electrical Times. (R 40)

BRITISH ELECTRICITY AUTHORITY, Headquarters, Bankside House, London, require a SECOND ASSISTANT ENGINEER in the Utilisation Research Section of the Commercial Department. Candidates should be Electrical Engineers, preferably with a University degree or equivalent qualification, with an enquiring mind and experience in Electricity Supply. The duties are concerned with researches in the field of supply economics, especially load and distribution analysis. Salary N.J.B., Grade 2, £971/£1,325 per annum inclusive. Applications stating age, qualifications, experience, present position and salary to Director of Establishments, Winsley St, London, W.1, by 25 Mar., 1955. Quote Ref.: AE.578. (R 141)

BRITISH ELECTRICITY AUTHORITY, London, invite applications for the appointment of a THIRD ASSISTANT ENGINEER to supervise the instruction of welding high pressure pipes and vessels at a Training Centre in London. Candidates should have technical knowledge and experience of both gas and electric welding and be capable of teaching workmen both practical and technical aspects of welding. Salary within N.J.B. Grade 3, £908/£1,125 inclusive, according to qualifications and experience. Applications stating age, qualifications, experience, present position and salary, should be forwarded to D. Moffat, Director of Establishments, Winsley St, London, W.1, to arrive not later than 25 Mar., 1955. Quote Ref.: AE/576. (R 142)

MECHANICAL AND ELECTRICAL ENGINEER. Applications invited from M. and E. Engineers fully qualified to take charge of a large plant organisation on a Contract, extending over a period of years. Complete charge of personnel, maintenance and repairs of heavy excavating plant, powered by Electricity and Diesel. Previous experience with a Civil Engineering Contractor an advantage. Applications in confidence to—Box No. 4357, Electrical Times. (R 188)

**ELLIOTT BROS. (LONDON) LTD. DESIGN ENGINEERS**

Applications are invited from suitably-qualified MECHANICAL and/or ELECTRICAL ENGINEERS for design and development work on precision electro-mechanical and hydraulic equipment. Experience in electrical or hydraulic servo-mechanisms an advantage but not essential. Education preferably to degree or H.N.C. standard with sound practical experience.

Applications, stating age, experience and salary required, to:

**Personnel Officer,**
**Century Works, Lewisham, S.E.13.**
(R 172p)

BRUSH ELECTRICAL ENGINEERING COMPANY LTD., have vacancies for men of ambition seeking progressive and responsible positions as TENDERING and CONTRACTS ENGINEERS in their Commercial Departments at Loughborough. Applicants should be capable correspondents with experience in one or more of the following: turbo - alternators, rotating machines, switchgear or transformers. Additionally, vacancies exist in the General Engineering Division for men having specialised knowledge of comprehensive power schemes for both diesel and steam generating stations. Appointments will be of a permanent nature with good salaries, and excellent prospects are open to suitable men. Conditions of service include non-contributory staff assurance. Please write with full details in confidence to the Chief Personnel Officer, Brush Electrical Engineering Co., Ltd., Loughborough. Candidates who may wish to obtain further information before making official applications can do so by making contact with our various Branch Managers, located at Glasgow, Manchester, Aberdeen, Birmingham, Bristol, Cardiff, Ipswich, Leeds, London, Newcastle and Sheffield. (R 94)

CONSULTING Engineers require ELECTRICAL ENGINEER/DRAUGHTSMAN, age 25 to 30 years. Applicants should be experienced in substation plant, power and lighting layouts for heavy industrial installations. Preferably of H.N.C. standard. For Application Form send P.C. to Sir Bruce White, Wolfe Barry and Partners, 1 Lygon Place, Grosvenor Gdns, London, S.W.1. (R 187)

**A SENIOR ENGINEER**

is required immediately by an internationally known Electrical Engineering Company situated near London, to lead a large team of development and design engineers engaged on the complete development of servo systems, hydraulic equipment and electro-mechanical apparatus.

Applications are invited from suitable engineers, fully experienced in controlling a team of development engineers and drawing office personnel, and having a good knowledge of the routine work of a development laboratory. Membership of the Electrical or Mechanical Institute coupled with an engineering degree, is considered essential for this appointment. A salary of up to £1,500 will be paid to the successful applicant and housing assistance will be given if required.

Applications, which will be considered strictly confidential, giving full details of experience and qualifications, etc., should be addressed to

**Box No. 4297**
Electrical Times (R 61p)

## ELECTRICAL DRAUGHTSMAN

required by The Steel Company of Wales Limited (Steel Division), Port Talbot, in their Engineering Drawing Offices.

Highest rates. Permanent positions. Attractive Pension Scheme.

Those wishing to apply should send full particulars of age, qualifications, experience, etc., to the:

**Personnel Superintendent**
**THE STEEL COMPANY OF WALES LIMITED**
**(Steel Division)**
**P.O. Box No. 3, Port Talbot, Glam.**
(R 59p)

CHIEF ASSISTANT is required in London in the Sales Department of a leading manufacturer of low tension switch and distribution gear. Consideration will be given to qualified electrical engineers not over 40 years of age, with both works and sales experience. This appointment has particularly attractive prospects of promotion and only candidates capable of advancement to more senior positions in the Company should apply. Letters of application should be addressed to the Staff Manager—Box No. 4343, Electrical Times. (R 157)

CONSULTING Engineers require ELECTRICAL DESIGNER/DRAUGHTSMAN, age twenty-four to thirty-five, experienced in all classes of lighting and power installations for hospitals, schools, industrial projects, preparation of contract and specifications, etc. Good draughtsmanship essential. Reply to A. F. Myers and Partners, 147 Victoria St, London, S.W.1. (R 186)

CROMPTON PARKINSON LTD., Wheatley, Doncaster, have the following vacancies:

1. DRAUGHTSMAN for work on the mechanical design of fractional horse power motors.
2. DRAUGHTSMAN with experience of tools, jigs and press tools.
3. DRAUGHTSMAN for the design of fluorescent lighting fittings.
4. METHODS ENGINEER. The duties include the technical direction of methods in connection with pressure die casting in all its aspects as applied to the manufacture of F.H.P. motors and units; a knowledge of subsequent machining operations would be an advantage

These positions offer splendid opportunity for men with ability.

The Company operates a Superanuation Fund to which employees contribute when eligible.

Apply to Personnel Officer giving details of qualifications, experience, age and salary required. (R 144)

DEVELOPMENT ENGINEERS, experienced Draughtsmen and Trainee Draughtsmen required for expanding development programme of various types of electro-mechanical devices. These are permanent appointments with good prospects of promotion. Superannuation scheme. Present staff are aware of this advertisement. Applications in confidence to the Chief Design Engineer—Box No. 4351, Electrical Times. (R 178)

### DEVELOPMENT ENGINEERS

FERRANTI LTD. (Meter (Dept.), Hollinwood, Lancs, have the following vacancies: DEVELOPMENT ENGINEERS of approximately graduate status in Electrical Engineering or Physics. The work involves a variety of electrical and electromechanical problems arising in the design and development of electrical measuring devices with emphasis on integrating electricity meters. Reference M.D.E. Permanent staff appointments with pension benefits.

Application form from:

**Mr T. J. Lunt, Staff Manager,**
**Ferranti Ltd., Hollinwood, Lancs.**
*Please quote reference* (R 108p)

DRAUGHTSMAN, aged 20/30, preferably with Higher National Certificate in Mechanical or Electrical Engineering required for interesting work on development of Overhead Transmission Line equipment and busbar installations. Pension Fund. 5-day week. Staff Canteen.

Apply in writing, stating qualifications, experience, salary required and quoting ref. L/78/55 to Staff Officer, British Insulated Callender's Cables Ltd., 21 Bloomsbury St, London, W.C.1. (R 175)

DRAUGHTSMEN: (1) ELECTRICAL LAYOUT DRAUGHTSMAN required by Consulting Engineers for work in connection with E.H.T. outdoor switching and transforming substations at their Weybridge Office. Minimum technical qualifications, H.N.C. or equivalent and suitable experience with a leading switchgear or transformer manufacturer. (2) JUNIOR DRAUGHTSMAN required to assist on the above work. Applications giving full particulars of experience, age and salary required to Kennedy and Donkin (ref.: HPC), Holme Chase, St. Georges Ave, Weybridge, Surrey. (R 72)

ELECTRICAL ENGINEER with degree required for position in Technical and Testing Departments of large Telecommunication Cable Works in London area. Position permanent and pensionable with good prospects of advancement. Apply with full details to—Box No. 4283, Electrical Times. (R 31)

ELECTRIC LAMP MANUFACTURERS (ELMA) require live SALES AGENTS for the following areas: (*a*) Gloucestershire and Wiltshire; (*b*) North Wales and Anglesey; (*c*) Northern Ireland; (*d*) Kent and Sussex. Applicants should be well connected with Electricity Boards, Industrial Users and Wholesalers. Apply with details of agencies held, etc., to—Box No. 4335, Electrical Times. (R 145)

ELECTRICAL ENGINEER required, preferably with Higher National Certificate qualifications to service specialised automatic light duty relay control equipment. Must have instrument and telephone experience. Will be required to meet high executives. Must have engaging personality and initiative and be prepared to travel. Special training will be given to successful applicant. Apply stating age, training, experience and salary required.—Box No. 4329, Electrical Times. (R 126)

ELECTRICAL ENGINEER with design and development experience required by London company manufacturing heating equipment for laboratory and industrial use. The applicant should have initiative and will be required to co-ordinate and guide the development of new products through all stages. To a man 30-40 years of age the position offers wide scope in a very interesting expanding field. Academic or professional qualifications and ability to control staff are necessary. The post is permanent with good prospects of advancement. Salary according to qualifications and experience. Apply in strictest confidence stating age, qualifications, experience and present remuneration to—Box No. 4327, Electrical Times. (R 125)

ELECTRICAL ENGINEER required for Electrical Department of Works in the North East. He should have a sound practical training, drawing office experience, knowledge of motor control gear resistance calculations, and preferably some experience of electrical heating for industrial applications. Apply giving full details of experience, technical qualifications, age, whether married or single, and salary required, to—Box No. 4299, Electrical Times. (R 62)

ENGINEER with electrical or physicist degree required for development work on testing equipment for telecommunication cables. Permanent and pensionable position at salary commensurate with experience and qualifications. Please apply giving full particulars to Personnel Officer, Southern United Telephone Cables Ltd., Dagenham Dock, Essex. (R 54)

### GENERAL MANAGER

IGRANIC ELECTRIC COMPANY LIMITED

invite applications for the post of General Manager of their new radio component factory at Bromborough, Wirral, Cheshire. Applicants must have proved administrative and organising ability, be thoroughly conversant with the radio and electronic business, and possess drive and initiative. The post is one of considerable importance and offers excellent prospects. This firm is a member of the Metal Industries Limited Group of Companies and applications should be sent to the Group Training and Personnel Officer,

**Metal Industries Limited,**
**60 Buckingham Palace Rd, London, S.W.1.,** and marked M/12.111.
(R 123 p)

EXPANDING Electrical Manufacturing Co. require AGENT with first-class connections Electricity Boards and Electrical Wholesalers in Midland Area to introduce well-known range of Domestic Appliances. Write full information—Box No. 4341, Electrical Times. (R 156)

EXPERIENCED ENGINEERS required for the erection of lattice tower and wood pole Overhead Transmission Lines and willing to serve either at home or overseas. Applicants should have a technical background up to Higher National Certificate (Electrical) standard. Pension Fund. Apply in writing stating age, experience, qualifications, salary required and quoting reference C/77/55 to Staff Officer, British Insulated Callender's Construction Company Limited, 30 Leicester Square, London, W.C.2. (R 28)

EXPERIENCED DOMESTIC APPLIANCE REPRESENTATIVE having first-class connection with Electricity Boards and Electrical Wholesalers required by well-known manufacturing Electrical Engineers to cover Electricity Showrooms and Wholesalers in London, Home Counties and East Anglia Territory. Salary and Commission basis. Write full details in confidence to—Box No. 4339, Electrical Times. (R 155)

JUNIOR RESEARCH ENGINEER. The Lamp and Lighting Division of the Research Laboratory has a vacancy for a young man with a degree, H.N.C., or equivalent qualifications in electrical engineering or physics, for investigations into the performance of discharge lamp circuits and field operational problems. Please write, giving full particulars, to the Director of Research, The British Thomson-Houston Co., Ltd., Rugby, quoting reference MVR. (R 37)

MECHANICAL AND ELECTRICAL ENGINEER. Applications invited from M. and E. Engineers fully qualified to take charge of a large plant organisation on a Contract, extending over a period of years. Complete charge of personnel, maintenance and repairs of heavy excavating plant, powered by Electricity and Diesel. Previous experience with a Civil Engineering Contractor an advantage. Applications in confidence to—Box No. 4357, Electrical Times. (R 188)

MUNICIPAL MUTUAL INSURANCE LIMITED has a vacancy for a LIFT SURVEYOR in London. Post is permanent and pensionable to satisfactory candidate who should have served an apprenticeship and have sound practical and theoretical knowledge of lifts. Technical qualifications: Higher National Certificate. Salary: £600/£850 per annum. Apply in own handwriting marking envelope: "Application Lift Surveyor" and "Private and Confidential" to Chief Engineer, 22 Old Queen St, Westminster, S.W.1. (R 185)

**TRANSFORMER ENGINEERS**

Vacancies for men with a Degree or H.N.C. for design of large high voltage and medium power transformers. The department is expanding rapidly, and the work is interesting and varied. The posts are permanent and pensionable. Applicants must have completed or be exempt from National Service. Write for application form to:

**The Personnel Manager,**
**Metropolitan-Vickers Electrical Co., Ltd.,**
**Trafford Park, Manchester, 17,**
Marking envelope "P.I."
(R 153p)

MANUFACTURERS of Electrical Space Heating Equipment require TECHNICAL SALES REPRESENTATIVE for Scotland, resident in Glasgow area; age 30/40; knowledge of electric heating preferable; full informative applications in writing to Box D.237, Willing's, 362 Grays Inn Rd, London, W.C.1. (R 122)

NETTLE ACCESSORIES LIMITED, Harper Rd, Wythenshawe, require person to SUPERVISE export department and assist sales manager. Salary according to experience and ability. Apply in own handwriting to Managing Director. (R 100)

REPRESENTATIVE required by leading manufacturer of electrical accessories to cover Southern Electricity Board area. Applicants should have good contacts with wholesalers, contractors and architects. This is a permanent progressive position with superannuation and a first-class opportunity for the right man. Apply in own handwriting to Sales Manager, M.K. Electric Ltd., Wakefield St, N.18. (R 34)

REPRESENTATIVE, resident in London Area required for TEMCO Electrical Accessories. Salary, commission, expenses and car provided. Pension Scheme in operation. Written applications, which should state remuneration required, to Mr S. M. Harris, T.M.C.-Harwell (Sales) Ltd., 37 Upper Berkeley St, London, W.1. (R 154)

REPRESENTATIVES required for London and some provincial areas. Lamp sales experience an advantage, good conditions, pension scheme, etc. Apply with full details in confidence to General Manager, Stella Lamp Co., Ltd., 37 Oxford St, W.1. (R 140)

SALES MANAGER required by expanding London Firm of Electrical Engineers. Preference will be given to applicant having good connections with Laboratory Supply Houses. Write in strictest confidence giving brief details of age, qualifications, past experience and remuneration required to—Box No. 4349, Electrical Times. (R 177)

SUPERVISING ENGINEER (Electrical) required with experience in estimating for and supervising large electrical contracts. Write stating previous experience, salary—W. J. Furse and Co., Ltd., Electrical Contractors, Traffic St, Nottingham. (R 173)

**VENNER LIMITED**
*require*

(*a*) ELECTRONIC ENGINEER/LABORATORY ASSISTANT with experience in design and manufacture of low-power transmitters, receivers, etc.

(*b*) ELECTRICAL ENGINEER/LABORATORY ASSISTANT with experience in development of small generators, etc.

Salaries and conditions for these Staff vacancies are attractive, and there is a Pension Scheme. Applications should be addressed to:

**Personnel Manager,**
**VENNER LIMITED,**
**New Malden, Surrey.**
**(MALden 2442)** (R 89p)

SALES REPRESENTATIVE West and North Lancs and N. Wales, domiciled about Liverpool, required by manufacturers of wiring accessories and L.T. distribution equipment. Technical education and experience essential. Knowledge of installation practice advantageous. Field selling experience necessary. Car driving and correspondence. Medical exam. Salary, commission, contributory pension, expenses, and car provided. State if telephone. Informative letter with photo please to—Box No. 4325, Electrical Times. (R 124)

SALES ENGINEER (Electrical) of proved sales ability required by an established company for the selling of specialised electrical equipment involving automatic light duty relay controls which can be applied for use in most industries. Successful applicant must have fundamental electrical training covering the above field, and engaging personality, and be capable of conducting interviews with high executives on engineering levels. Apply stating age, sales and engineering experience, other qualifications and salary required.—Box No. 4331, Electrical Times. (R 127)

SALES ENGINEER, experienced Power Factor Correction, required by leading capacitor manufacturer to deal with technical matters/quotations and prepared to travel in London and Home Counties. Write stating experience, age and salary required, to—Box No. 4337, Electrical Times. (R 146)

SENIOR and DETAIL DRAUGHTSMAN required to work on design and detail of electric switches and devices, plastic/porcelain mouldings, presswork, etc.

A.E.S.D. minimum, but good salary paid to experienced men.

Holiday arrangements honoured. 5-day week, Canteen. West London Area. Saturday morning interviews arranged. Write giving details of experience and salary required to—Box No. 4303, Electrical Times. (R 64)

SENIOR ESTIMATOR required with initiative and having experience in handling comprehensive enquiries involving rotating electrical machinery up to 5,000 h.p./kW. A superannuation scheme in operation and the usual social amenities available in an organisation of progressive outlook. Promotions inside, and transfers to Sales normally made from Staff. All applicants will be treated with the strictest confidence and should be addressed to the General Manager, Lancashire Dynamo and Crypto Ltd., Trafford Park, Manchester 17. (R 71)

STATION ENGINEERS required by Air Ministry at R.A.F. and M.C.A. stations. Qualifications and experience required: (*a*) Ordinary National Certificate in Electrical Engineering or equivalent standard of technical education. (*b*) Recognised apprenticeship in electrical engineering. (*c*) at least three years' responsible engineering employment preferably on operation and maintenance of mine, factory or workshop plant and services. Supervisory experience an advantage as duties entirely supervisory and cover installation, operation and maintenance of high and medium voltage distribution system, internal electrical installations, and other miscellaneous installations, tools and equipment. Commencing salary according to age, qualifications and experience on range from £535 to £772. Appointments include liability for service overseas for which special allowance payable in addition to higher salary. Appointments non-pensionable. Only natural-born British subjects. Write, giving age, full details of qualifications and experience to A.B.1255/ME, Appointments Officer, Ministry of Labour and National Service, 1-6 Tavistock Sq, W.C.1. No original testimonials should be sent. Only candidates selected for interview will be advised. (R 132)

TECHNICAL ASSISTANT required by firm of Electro-Thermal Engineers. Aged 21/30. Drawing Office, Heating and/or Electrical experience. Superannuation Scheme, good salary. Write giving full details to—Box No. 4353, Electrical Times. (R 179)

**DRAUGHTSMEN**

JOHNSON AND PHILLIPS LIMITED

have vacancies in their Mechanical Engineering, Transformer, Switchgear, Junction Box and Outdoor Contract Department for experienced men.

These positions offer good prospects and carry a salary commensurate with experience. Applications giving age, training and experience to

**Employment and Welfare Manager,**
**JOHNSON AND PHILLIPS LTD.,**
**Victoria Works, Charlton, S.E.7.**
(R 88p)

TECHNICAL MANAGER required by Company employed in the manufacture of rubber and thermoplastic cables. Applicants should preferably be graduates in Electrical Engineering or Physics or hold equivalent qualifications, and should have previous experience in the electrical cable industry. Applications, stating age, qualifications, experience and salary required to be addressed to: Personnel Officer, St. Helens Cable and Rubber Co., Ltd., Trading Estate, Slough, Bucks. (R 99)

THE ASSOCIATED ETHYL COMPANY LTD., has vacancies for DRAUGHTSMEN in the Mechanical, Civil, Electrical and Instrumentation Sections of the Engineering Department at its Ellesmere Port Works.

Candidates should have had a sound practical training followed by at least three years' experience in a drawing office and have obtained the Higher National Certificate or be currently studying for same.

Starting salary will be offered commensurate with age, qualifications and experience.

Applications should be sent to the Deputy Manager—Personnel, The Associated Ethyl Company Limited, Ellesmere Port, Cheshire. (R 135)

## APPOINTMENTS FILLED

THE post advertised under Box No. 4129 has now been filled.

## APPOINTMENTS WANTED

ENGINEER A.M.I.E.E.—abroad since 1947, executive posts held—excellent references. Requires executive appointment U.K. or overseas. Manufacturer's works large machine test experience, power generation and plant utilisation, mining, industry.—Box No. 4309, Electrical Times. (R 75)

SALES REPRESENTATIVE (30) with 8 years L.T. electrical installation and 7 years speciality selling experience, requires selling position in Northern Counties. Good references and driving licence. Desiring change.—Box No. 4317, Electrical Times. (R 119)

## WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (R 3)

To **ELECTRICAL CONTRACTORS AND ARCHITECTS**

Qualified, experienced Mechanical-Electrical Consultant and Industrial Adviser, extensive Industrial experience, open to undertake preparation (Estimates and Drawings, etc.), all types Power, Heating and Lighting Installations privately. Box No. 4355, Electrical Times. (R 184p)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (R 4)

CAPACITY available for all types of COIL WINDING, ranging from 47 s.w.g. to 25 s.w.g. Lengths up to 4½ inches. Efton Co., 49 Sisters Ave, S.W.11. (R 136)

GLASSWORK. Small busines concern with long experience of Electronic and Scientific Glasswork, has capacity for same. Low estimates for your requirements.—Box No. 4333, Electrical Times. (R 128)

IMMEDIATE capacity available for all types of ELECTRICAL INSTRUMENT WINDINGS including Stator and Armatures, for fractional h.p. motors.

Also assembly work required—Geraghty Products Ltd., 44 Packington Rd, Acton, W.3. ACO 7306. (R 96)

LET US SOLVE YOUR BREAKDOWN PROBLEMS, repairs speedily carried out by experts. Collection and Delivery by our own transport. A. T. Robinson, Electrical Power Engineers, The Green, Southall, Middx. Southall 3494/5/6. (R 5)

## WANTED

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (R 2)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (R 1)

## AGENCIES

M.A.A.—THE BADGE OF A GOOD MANUFACTURERS' AGENT. Manufacturers requiring reputable Agents are invited to communicate with the Secretary, The Manufacturers' Agents Association of Great Britain and Ireland (Inc.), Rosebery House, 8 Breams Buildings, London, E.C.4. Membership available to established agents only. Particulars supplied. (R 133)

## FOR SALE

### BRITISH ELECTRICITY AUTHORITY
### London Division

OFFERS are invited for the purchase and removal from Acton Lane Generating Station of the following:

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STUDENT SCHOLARSHIPS for study at undergraduate level at a University or a Technical College. Duddell, value £200 per annum for three years. Arthur Fleming, value £120 per annum for four years (for a sandwich diploma course). Salomons, value £60 for one year. David Hughes value £60 for one year. Paul, value £75 per annum for four years. Thorrowgood, value £25 for one year.

The closing date for the receipt of applications is 2 May, 1955, for Student Scholarships and 1 June, 1955, for Graduate and Research Scholarships. Full particulars of the conditions of award attached to each scholarship and nomination forms may be obtained on application to the Secretary, The Institution of Electrical Engineers, Savoy Place, W.C.2. (R 130)

### E.A.W. CERTIFICATE FOR DEMONSTRATORS AND SALESWOMEN

THE E.A.W. EXAMINATION IN ELECTRICAL HOUSECRAFT (Theoretical) will be held on Thursday, 16 June, 1955, from 2 p.m. to 5 p.m. at various centres in Great Britain.

Full particulars and entrance forms may be obtained from:
Examinations Department,
The Electrical Association for Women,
45 Eastcastle St, London, W.1.

IMPORTANT.—The final date of entry for the Examination is 5 May, 1955. (R 129)

### SOMERSET EDUCATION COMMITTEE

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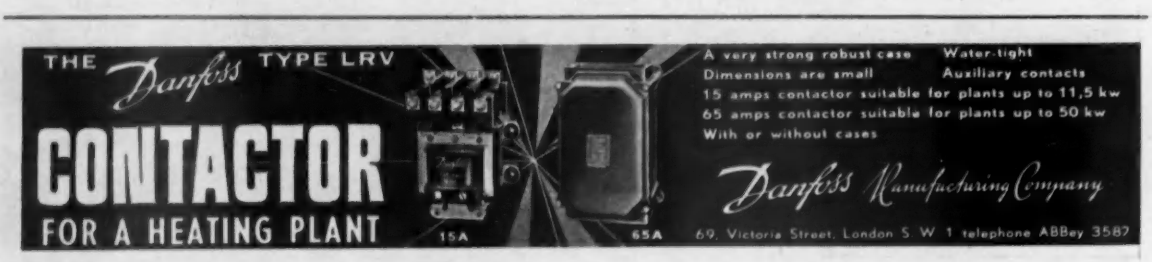
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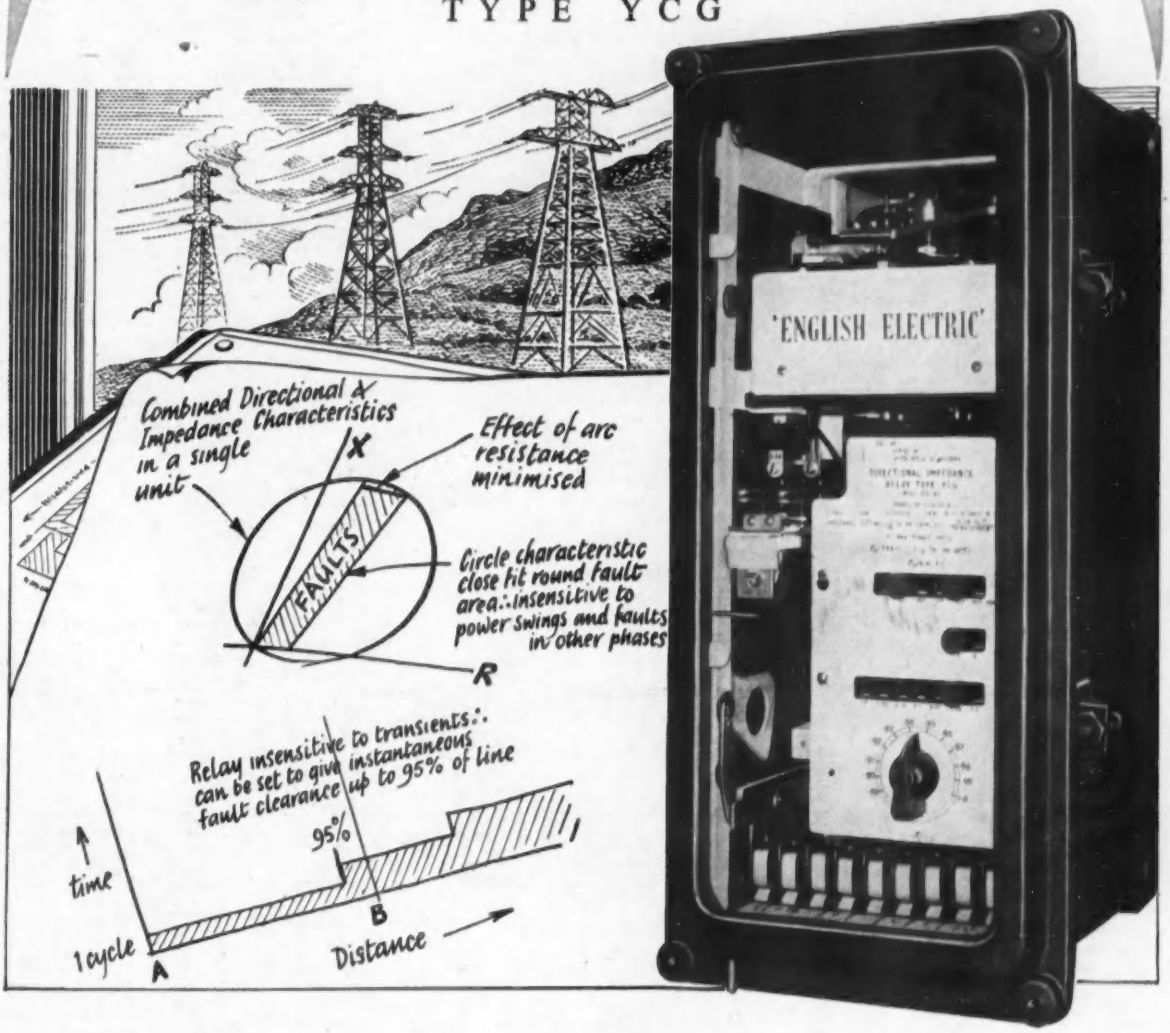
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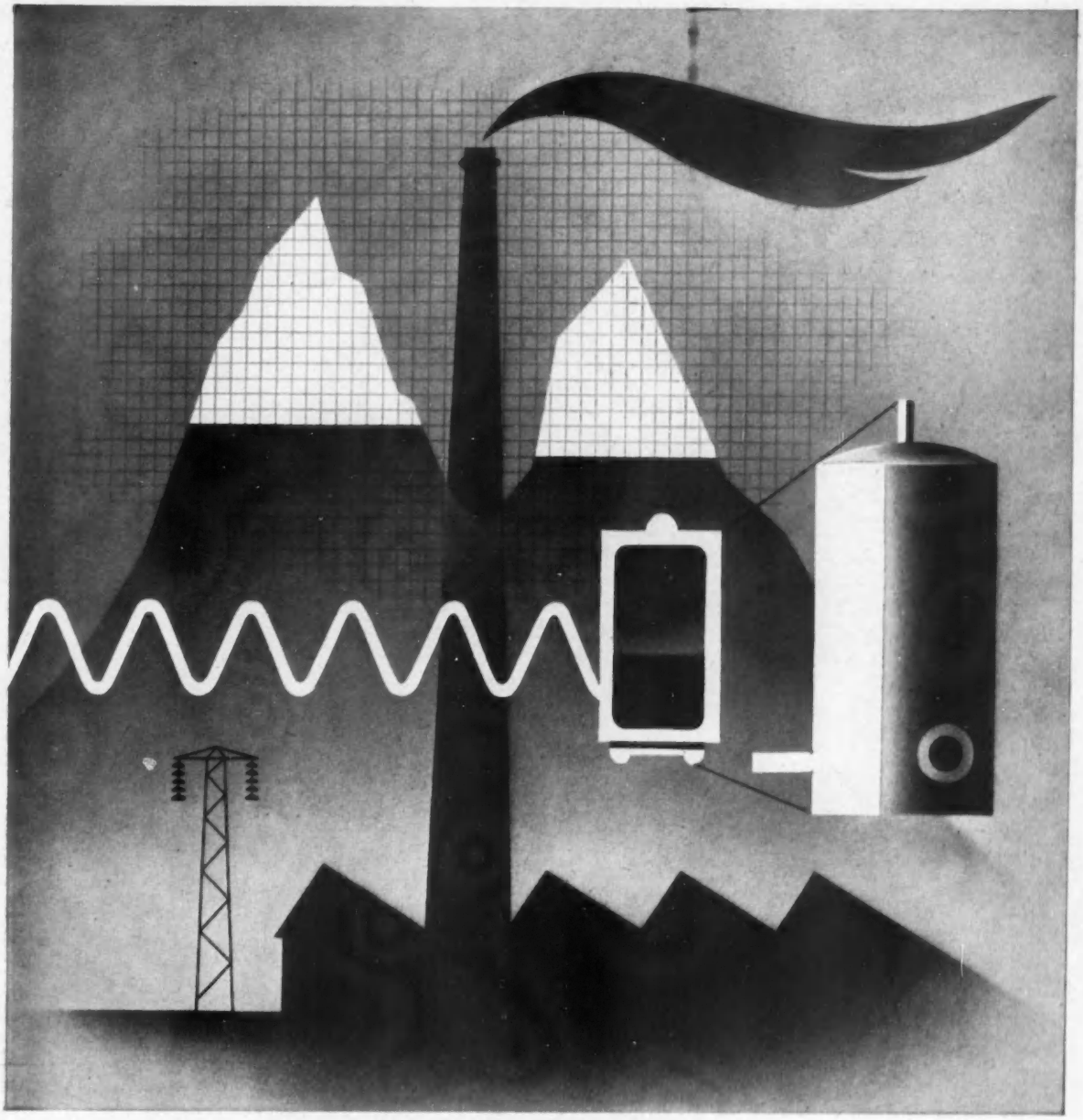

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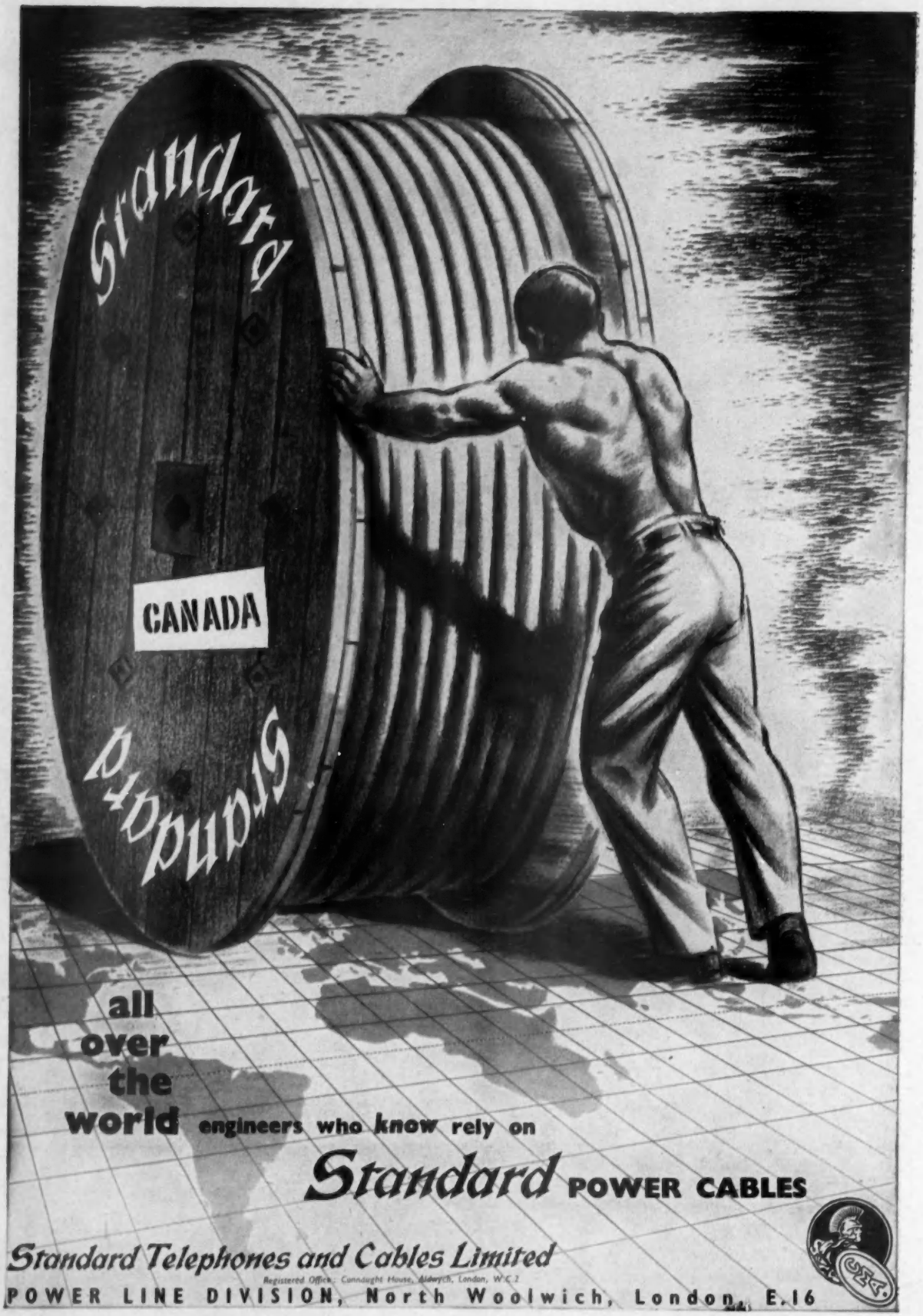


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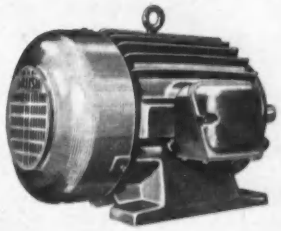

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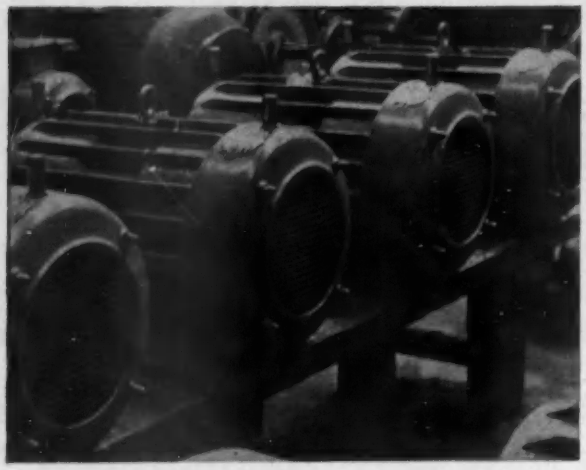

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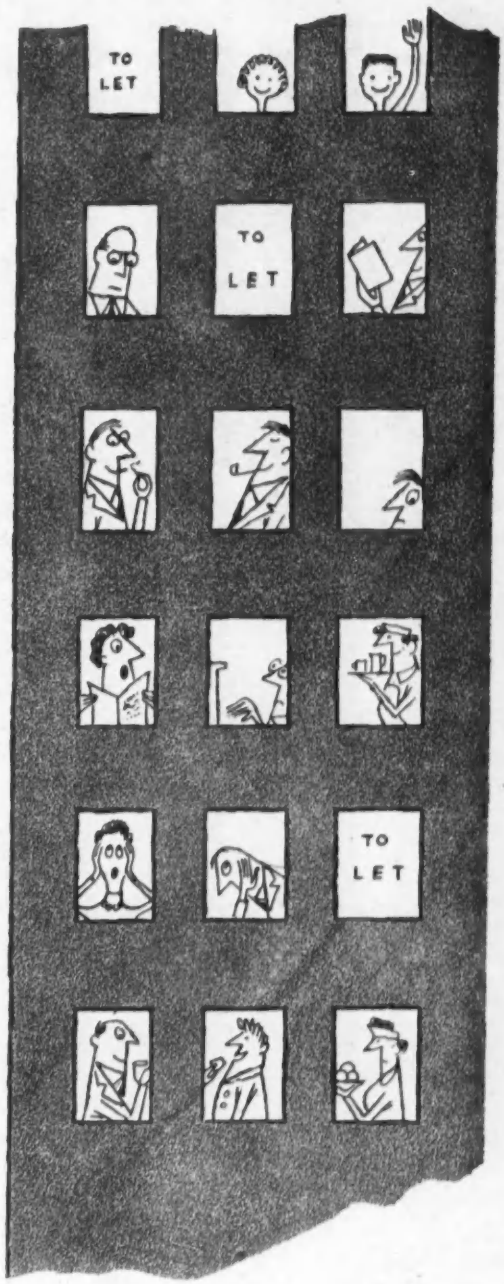


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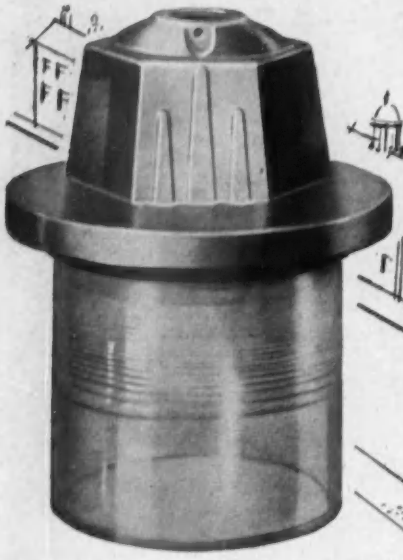

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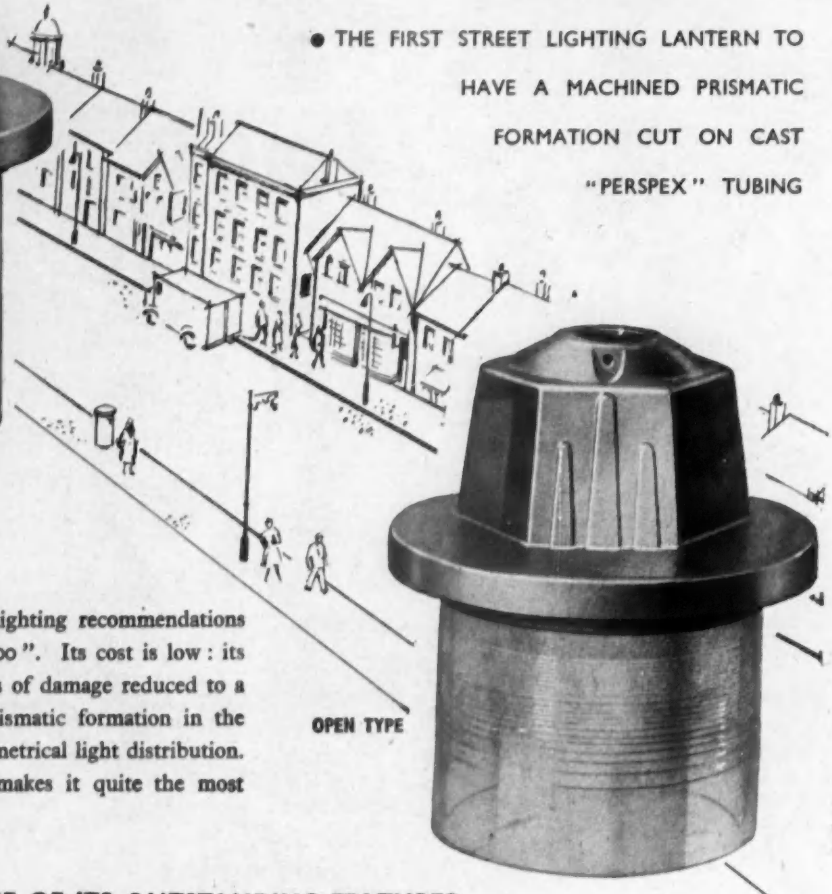

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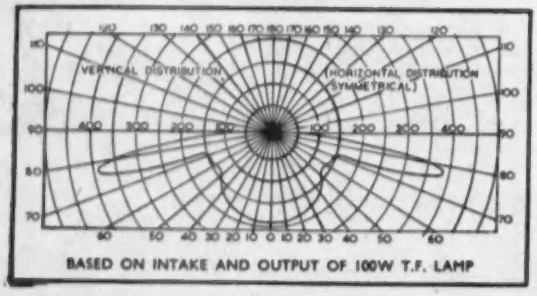


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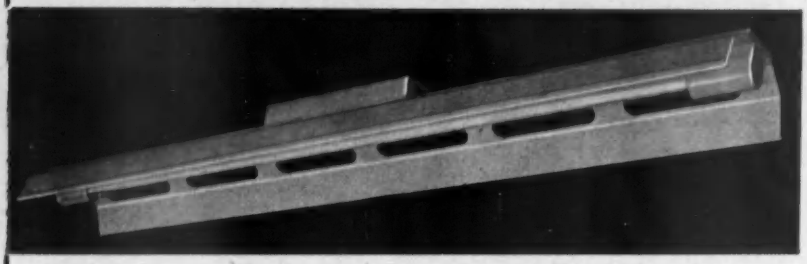

- ETERNA TROUGH Fittings are made of 22 gauge, Bright - Mild - Steel finished high gloss white stove enamelled and available in 5 ft. 80 watt Single Tube or 5 ft. 80 watt Double Tube version, either slotted as illustrated for partial upward light or without slots for downward light only.
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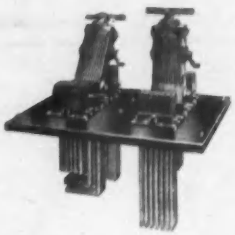

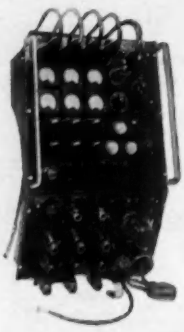

27½ kVA Control Panel (Right) manufactured for Ministry of Supply.

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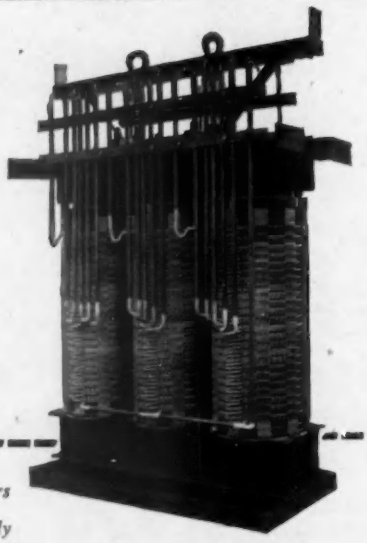

*The illustrations show transformers (left) as received at our works, and (right) completely rebuilt ready for service again.*

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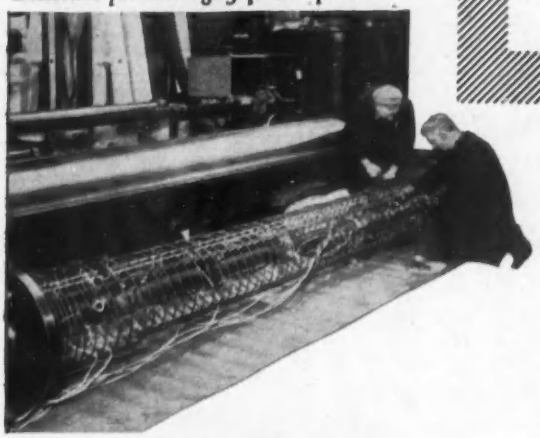
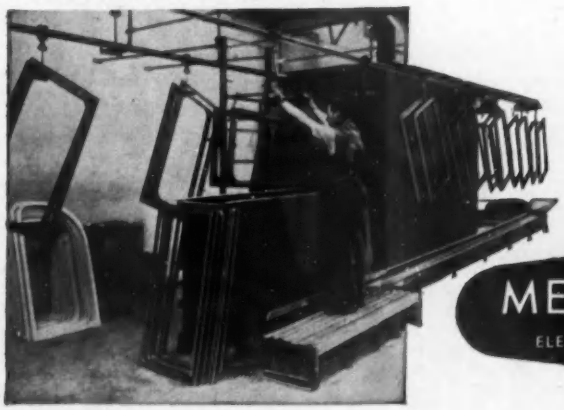


*Tubular-element Roller Heater.*



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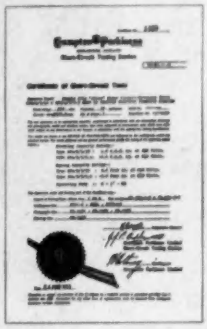

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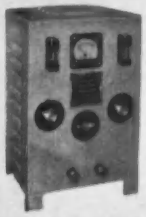

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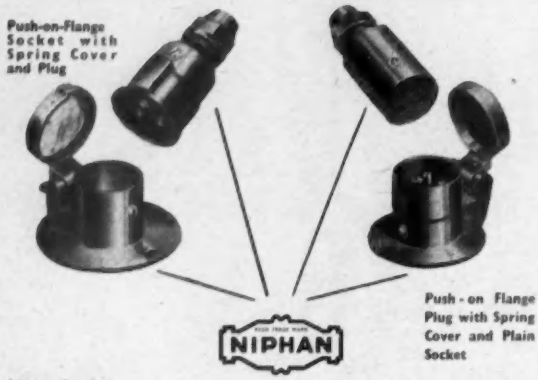


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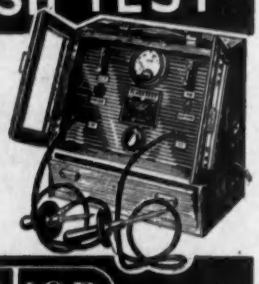

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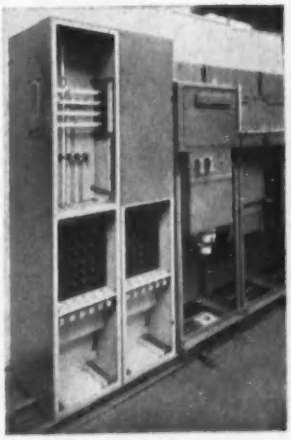

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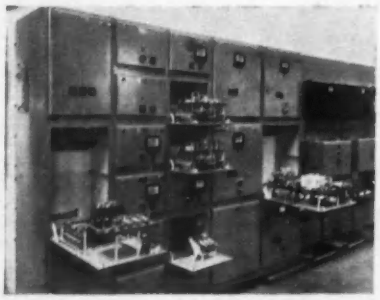

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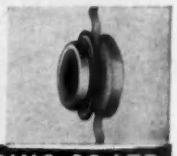

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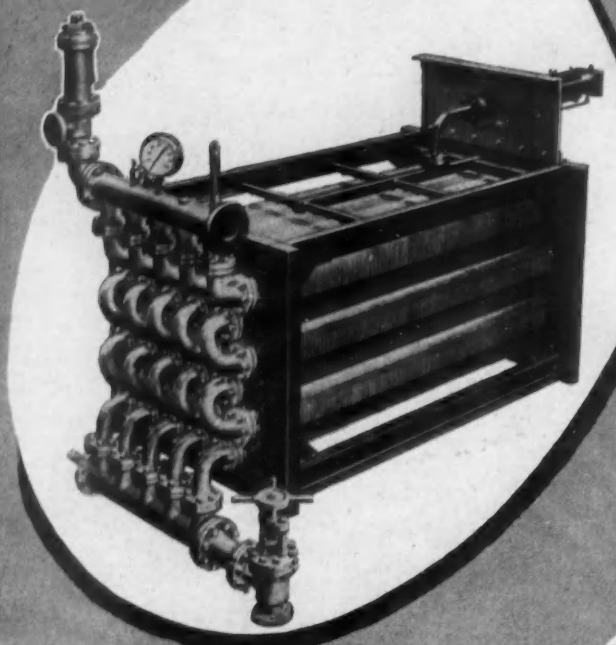

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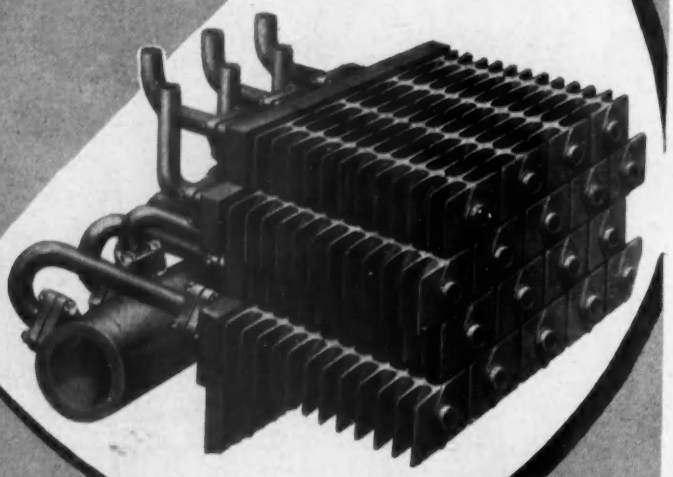

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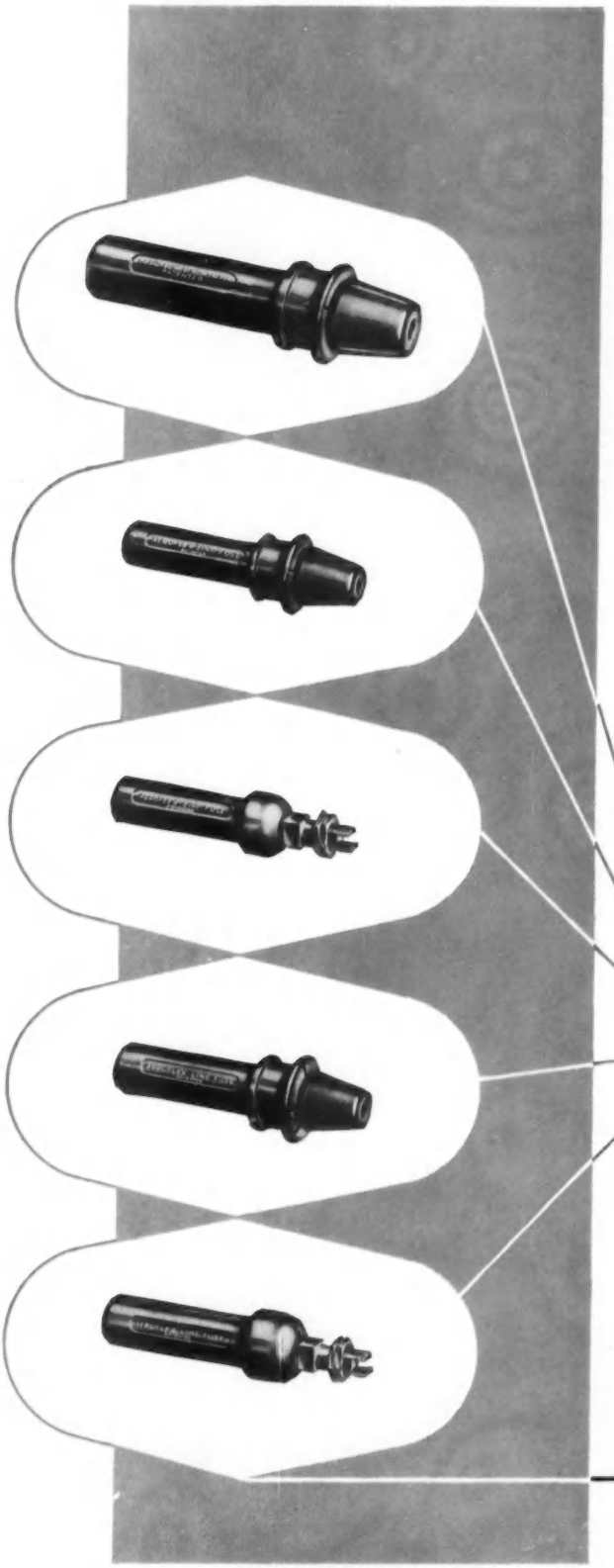

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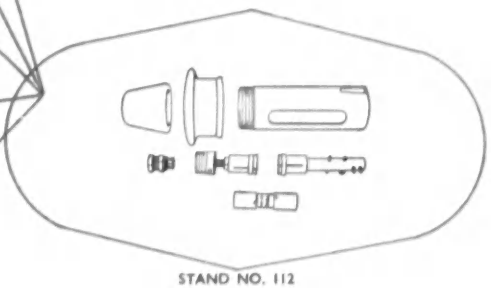

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